Soils Suitability Extension (SSE)
Version 1.0

User's Guide

August 24, 2000

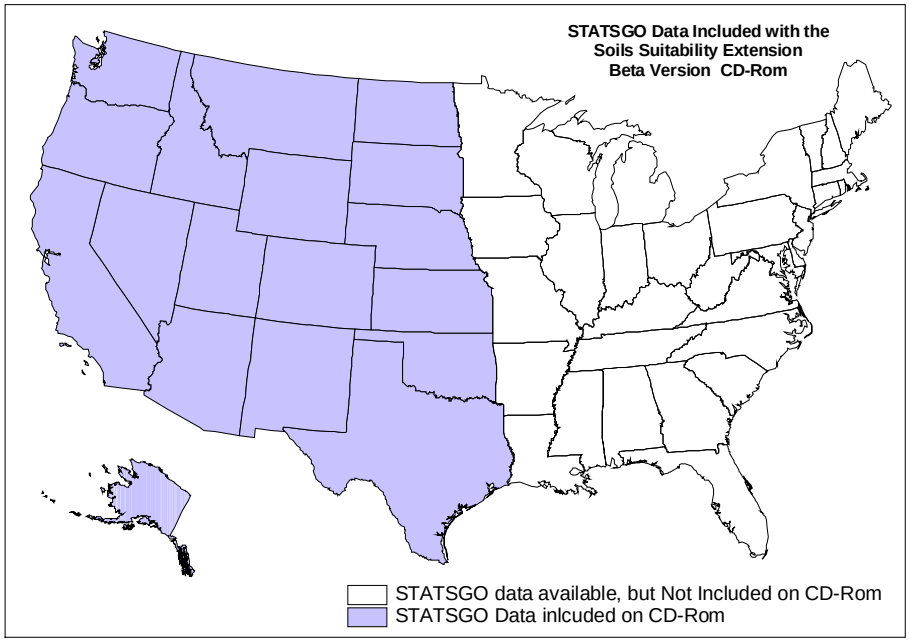
Table of Contents

1.0 Introduction

The Soils Suitability Extension (SSE) is a customized ArcView GIS extension developed at the National Science & Technology Center (S&T) (old name NARSC). SSE allows someone with minimal ArcView skills and without a soils background, easy access to existing soils data. SSE provides a quick and easy method of querying and displaying National Resources Conservation Service (NRCS) STATSGO and SSURGO soil data over existing spatial data. SSE is not a soil browser; rather it is a set of canned queries to access STATSGO and SSURGO data. SSE does not replace any of the NRCS soil browsers; rather provides the user with a different way to access STATSGO and SSURGO soil data.

To use the extension your must add your own data to a "view" in ArcView. Once the extension is turned on, the selected query will add the STATSGO or SSURGO data as a layer on top of your existing data. What really occurs here, is that the STATSGO and SSURGO data are projected to match the projection of your data. This is based on a rule in ArcView GIS that you may not have two themes displayed that have disparate projections. In order for the program to know the projection of your own data, the top layer or theme in the view must be an ARC/INFO coverage. The coverage may be ARC/INFO 6.x or 7.x format. The major restriction here is that the top theme must not be a shapefile or an image file as they do not store projection information is a standardized way. This User Guide will walk you through installation and getting started with the program.

Only the Western States STATSGO data is included on the executable file to save space. The states included are shaded in gray below.



1.1 Soil Information - Rangeland Health

Soils information plays an important role in developing Ecological Site Inventories (ESI) and in Rangeland Health evaluation. ESIs are based on interpretation from soil survey information relating to setting characteristic and physical, chemical and biological properties of the soil as a plant growth medium. Also, soil behavioral characteristics can be predicted.

GIS provides the opportunity to more effectively display and analyze soil information and when properly evaluated can be used for risk assessment, erosion prediction, categorizing ecological site (range site resislense) site selection and for extrapolating information from sampled areas particularly when overlaid with remote sensing. Soils information interfaces with the rangeland health evaluations.

1.2 Elements of Soil Quality

The three main functions of soil are to provide a medium for plant growth through the environment, water regulation and partitioning, and to serve as an environmental buffer. A soil's chemical, physical, and biological properties work together to make a soil fit to perform these functions.

Plant Growth

A good-quality soil:

- provides a suitable medium for seed germination and root growth (including the absence of unsuitable chemical conditions, such as acidity or salinity, that are harmful to plant growth)
- supplies a balance of nutrients to plants
- receives, stores, and releases moisture for plant use
- support a community of microorganisms that recycle nutrients through decomposition and help plants to resist disease

Water regulation and partitioning

Water entering the soil as either rain or melting snow has several fates. It can soak into the soil, to be stored or taken up by the plants. It can percolate down through the soil and enter the groundwater. If it fails to penetrate the soil, it can move along the soil surface as runoff.

Depending on the amount of precipitation received, a good-quality soil stores enough water to promote optimal growth. It allows only a limited amount of water either to run off the soil surface, carrying away soil sediments, or to seep below the root zone into the groundwater.

Environmental buffer

A good-quality soil can accept and hold nutrients and release them as required by plants. To some extent, it can also break down harmful compounds into substances that are nontoxic to plants and animals and therefore not polluting the surface water and groundwater. However, soil has a limited ability to perform this function and should not be expected to repair the damage of chemical contamination caused by human activity.

1.3 Attributes Of Rangeland Health

Soil/Site Stability

The capacity of the site to limit redistribution and loss of soil resources (including nutrients and organic matter) by wind and water.

Watershed Function

The capacity of the site to capture, store and safely release water from rainfall, run-off and snow melt (where relevant) to resist a reduction in this capacity, and to recover the capacity following degradation.

Integrity of the Biotic Community

Capacity to support characteristic, (adapted) functions and structural communities in the concept of normal variability and to resist loss of this function structure due to the distribution, and to recover following such disturbance.

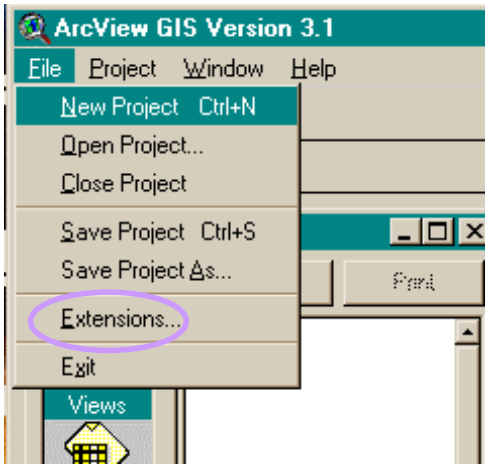
2.0 Getting Started

First you need to access the extension and the data. This information is provided in a single executable WinZip file. This file is either downloaded from the Internet or it is copied from a CD to your hard drive. This file needs to be unzipped. Please see *Appendix A -Installation*, for information on how to unzip this file.

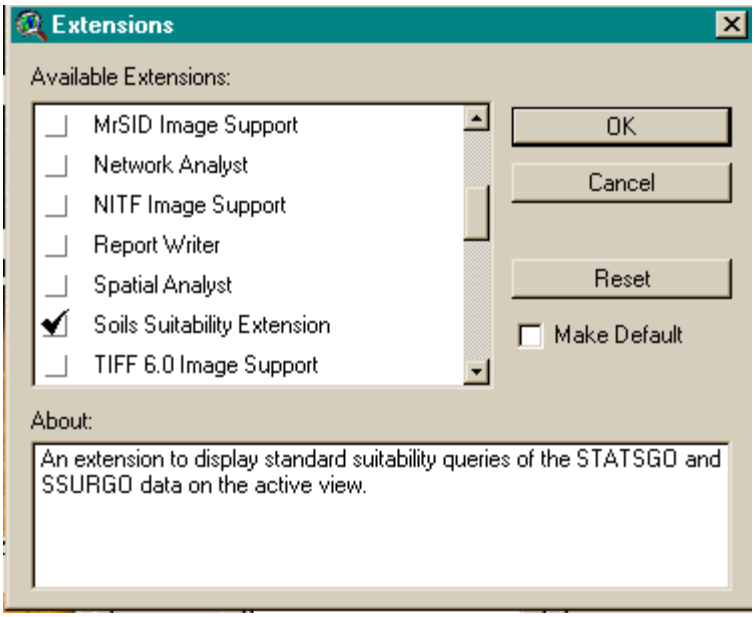
Once the file is unzipped, *Start ArcView*.

2.1 Add the Extension to a New ArcView Project

To access the SSE tools from within ArcView you use the *File: Extensions* option when the project window is active.



Once you have selected *Extensions*, the Extensions dialog window will come up and shows you the extensions that are available in ArcView. Scroll down until you see **Soils Suitability Extension** and click the check box adjacent to it. Then click the *OK* button. This will load the extension to your ArcView project for this session of ArcView only.

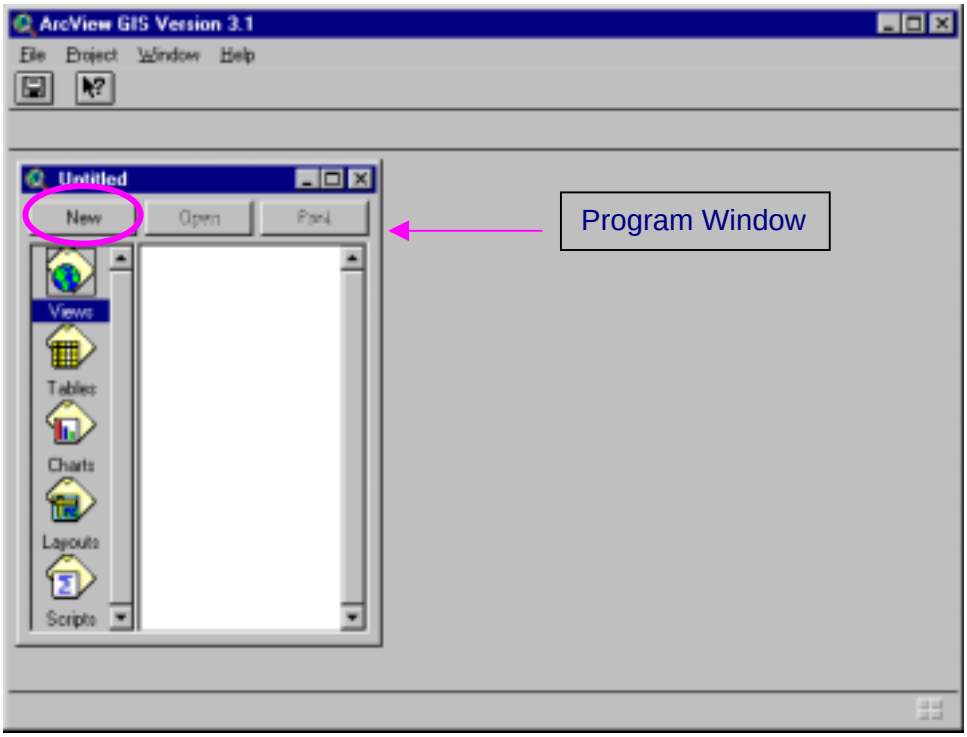


Note: If you do not see the "Soils Suitability Extension" in the list, then you have not copied the SSE.avx file to the appropriate location.

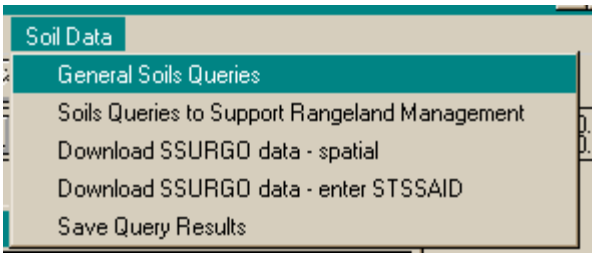
If you are having problems with variables on your NT please see, BLM's ArcView FAQ's Intranet web page, http://web.blm.gov/narsc/gis/faq/AVVariables.html

2.2 Turning on the Extension

The functionality of SSE is present on the View Document Interface as a collection of menus and tools. To see the new menu options create a new view to the ArcView session by highlighting the *Views* document icon in the program window and then, clicking on the *New* button.

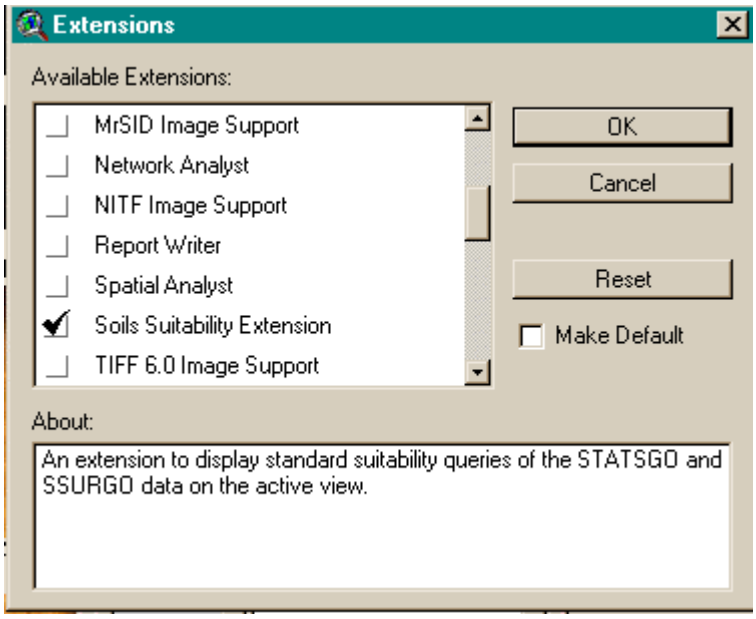


Once you have added a new view, you will see a menu option called **Soil Data**. This is a new menu of choices added with the SSE. This is the menu that you will use to query soil data.



2.3 Unloading the Extension

To unload the Soils Suitability Extension you must access the Extensions dialog through the *File: Extensions* option and uncheck the box next to **Soils Suitability Extension** selection. This will remove the extension menu and tool from the ArcView project and delete the temporary files.

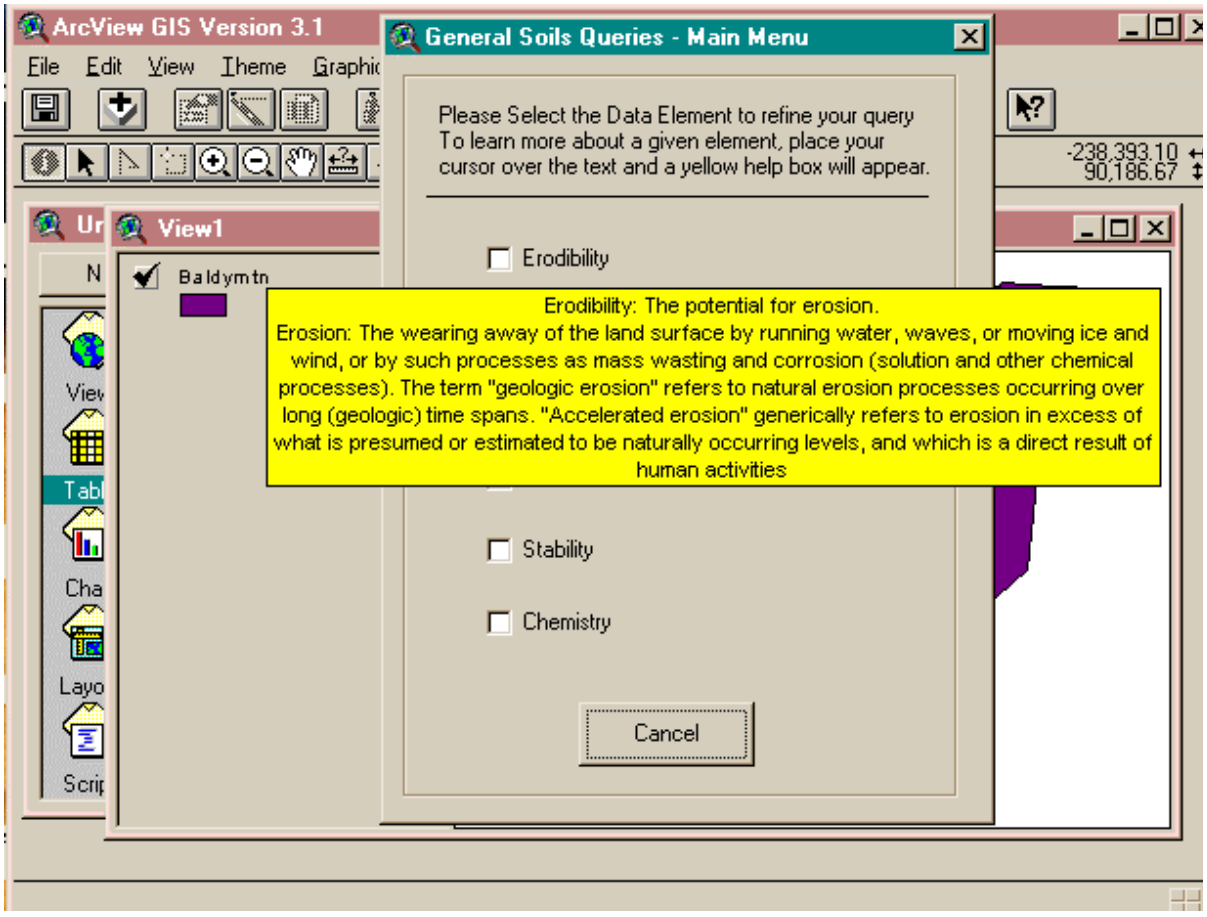


3.0 Obtaining Help

Help is available with this extension in two ways. One, is the use of yellow text boxes that pop up when ever your mouse goes over some text. Two, is the on-line User's Guide.

3.1 Yellow Help Boxes

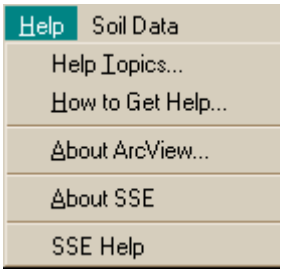
By placing your mouse over any of the check boxes or any of the text on any of the menus, a yellow help box will appear with informative text information about the subject. Most of this information is directly from the NRCS National Soil Survey Handbook.



Tip: If you find these yellow text boxes "annoying" keep you mouse to the left of the text boxes.

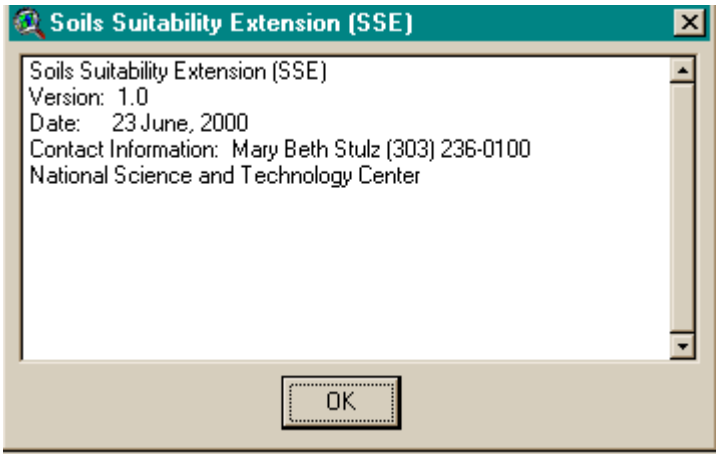
3.2 On Line Help

This User's Guide is available two ways. One, directly from the Internet, from the NARSC GIS web page (http://www.blm.gov/gis/narsc/soils/soils.html), two, from the ArcView Help Menu. Maintaining the User's Guide on line means only one copy needs to be updated and everyone using the extension has access to the latest and greatest version of the user's guide.



SSE Help will go to the Internet and bring up this User's Guide.

About SSE will display the following information:



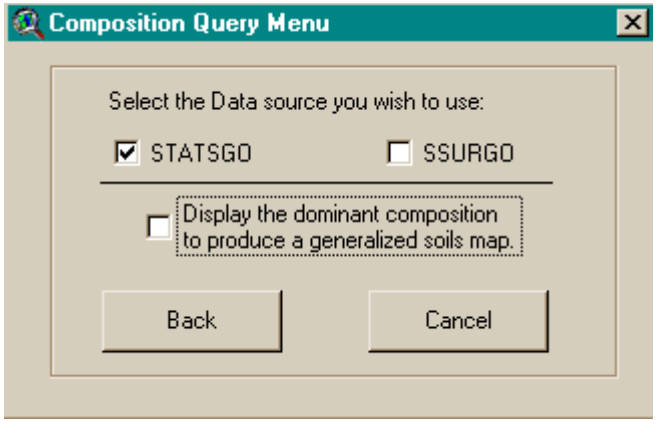
4.0 STATSGO or SSURGO

With this extension you can use either STATSGO (State Soil Geographic data base) or SSURGO (Soil Survey Geographic data base) data. The STATSGO data is included, for the Western US, with the SSE WinZip file.

STATSGO is "State general soil maps made by generalizing the detailed soil survey data. The level of mapping is designed to be used for board planning and management uses covering state, regional, and multi-state areas" (NRCS). STATSGO soils data covers the entire US. If there is no other detailed soils data available than STATSGO data can be used.

SSURGO is "The most detailed level of soil mapping done by NRCS. SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships, and county natural resource planning and management" (NRCS). However, SSURGO surveys are not in a digital format across the US. One of the tools available with this extension is a download utility. It is a "point and click" downloading tool, making it very easy for the user to download soil survey's from the NRCS ftp site.

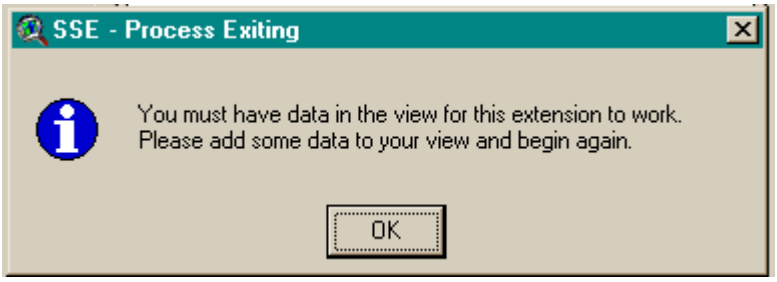
Potentially, with two data sets available to run the soils queries from SSE, the question is, which data set should you use? At the Field Office level you should be using the SSURGO data but may not always be available. This extension has made it easy to use either STATSGO or SSURGO data for each query that you run. At the top of each query dialog box is the option to run that query using either STATSGO or SSURGO.



The default data source when the extension is first started is STATSGO, but whatever you choose the 1st time will remain as the default for that ArcView session. Then any other query that is run will use SSURGO data.

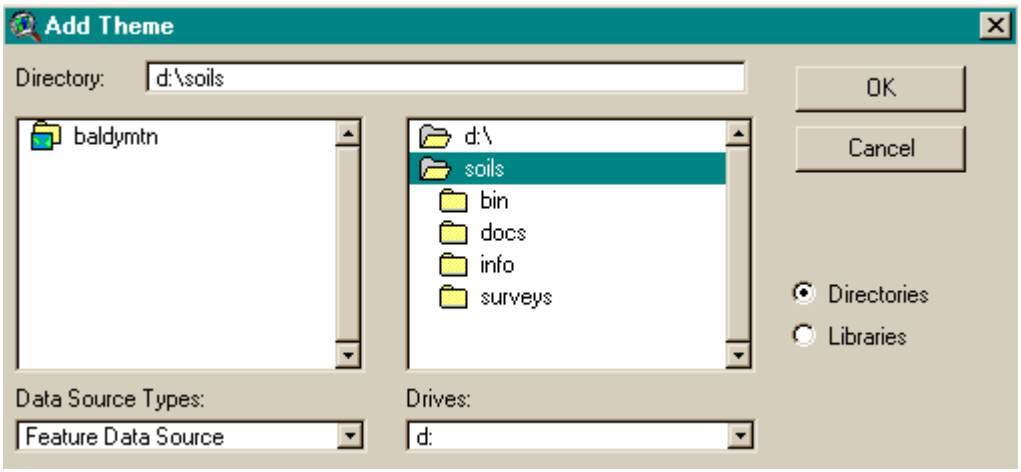
5.0 Using SSE

Once you have a blank View document open, it is time to add your own data. It is assumed that you will be looking at some area, for example an allotment, and you wish to view the soil characteristics for that allotment. So, you need to add an allotment theme to your View document window. If you attempt to run one of the Soil Data queries without having added some data to the view, you will receive the following message:

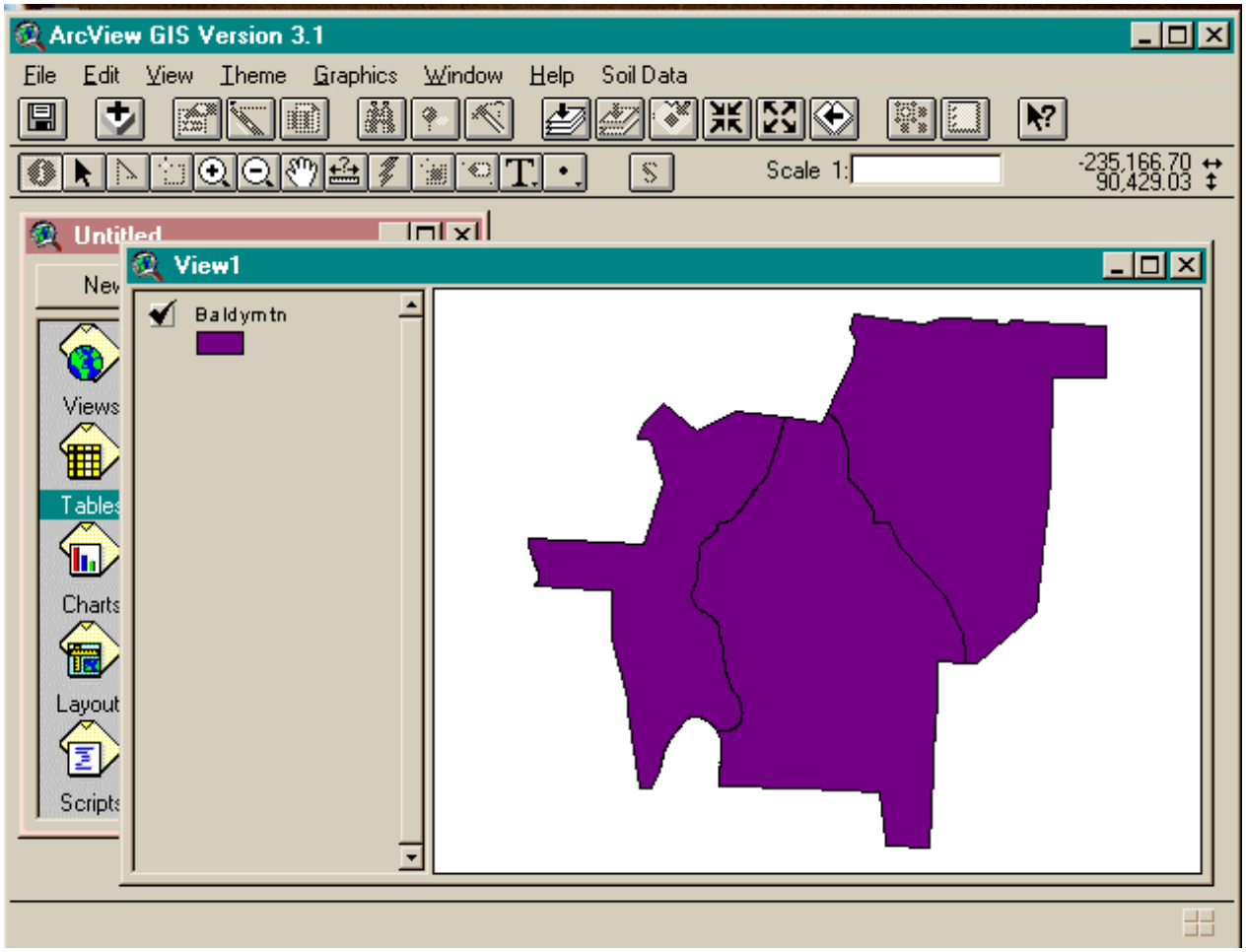


5.1 Add a Theme

To add a theme, click the  button from the button bar. The **Add Theme** dialog box will appear. You can use the mouse to navigate to the desired file(s) or you can enter the path name in the Directory box. In this example, the coverage baldymtn is going to be added to the view.



Click the *OK* button once a coverage has been selected. The dialog box will close and the theme will appear in the Table of Contents.

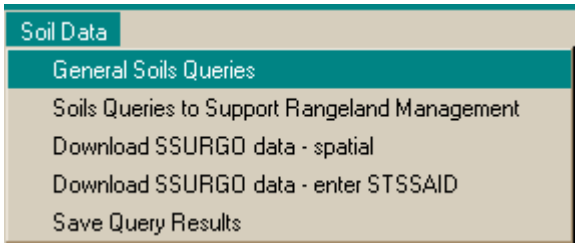


Click the box to the left of the coverage (a check mark will appear) and the coverage will be displayed. This is called turning the theme on. In the above example, the Baldymtn, theme or coverage is turned on.

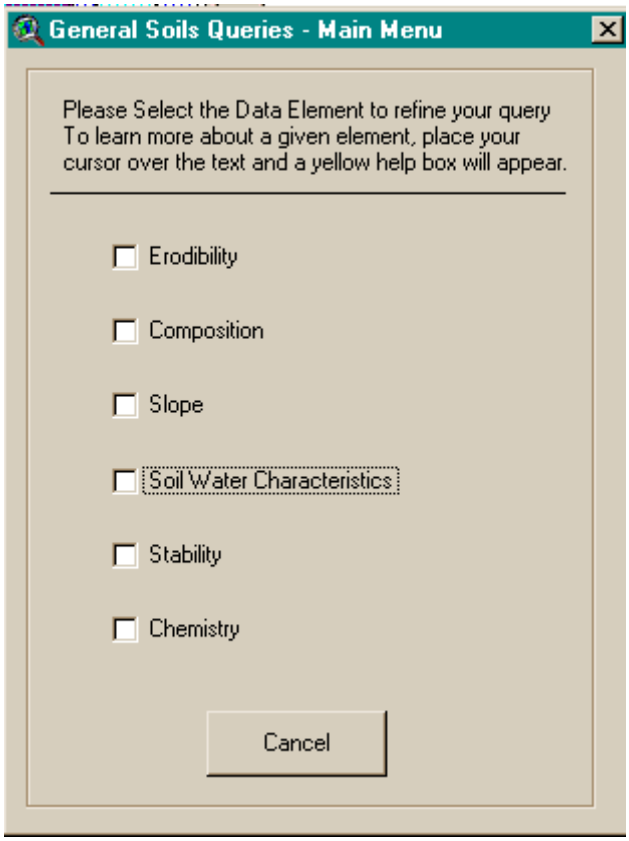
Now lets look at all of the soil queries for the Baldy Mountain allotment.

6.0 General Soils Queries

The general soil queries are divided into six major soil characteristic categories. Within each of these categories there are more options, further defining the soil characteristics.



From the **Soil Data** Menu select *General Soils Queries*. The General Soils Queries – Main Menu will come up.

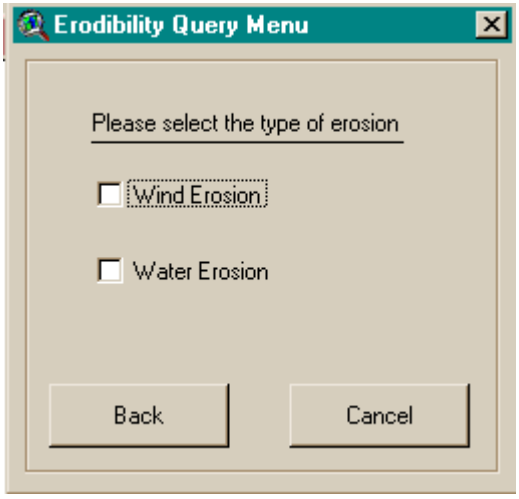


The first time you try to run a query, the Soils Extension dialog box will come up prompting you to identify the location of: 1) where you unzipped the WinZip file and 2) the location of your temporary directory. Please see Appendix B – SSE Preference File for more information.

To refine the query and eventually display data about the data element, click on the box next to the data element of interest.

6.1 Erodibility

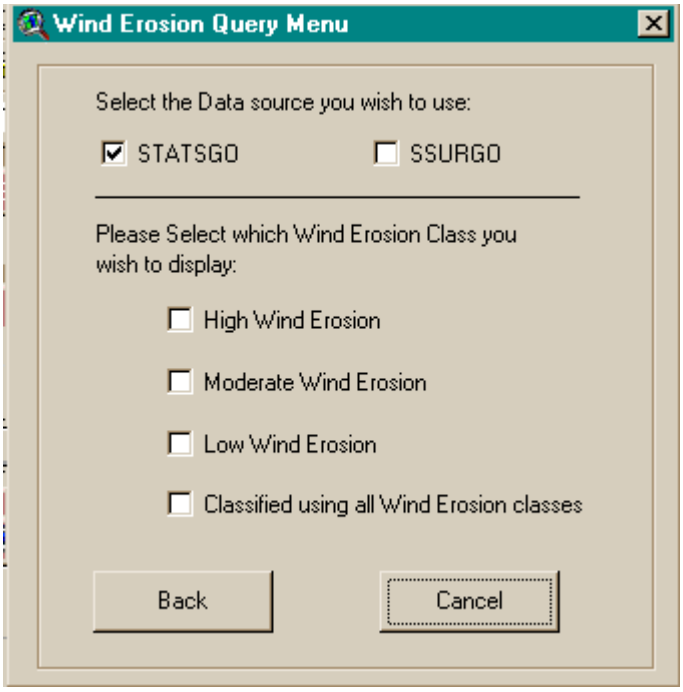
Erodibility: The potential for erosion. Erosion: The wearing away of the land surface by running water, waves, or moving ice and wind, or by such process as mass wasting and corrosion (solution and other chemical processes). The term "geologic erosion" refers to natural erosion processes occurring over long (geologic) time spans. "Accelerated erosion" generically refers to erosion in excess of what is presumed or estimated to be naturally occurring levels, and which is a direct result of human activities.



Wind Erosion is important in assessing the health of the soil and in assessing the soil's potential for different uses. Removal of increasing amounts of soil increasingly alters various properties and capabilities of the soil. Properties and qualities affected include bulk density, permeability, organic matter content, tilth, and water infiltration. Altering these properties affects the productivity of the soil.

Water Erosion consists of: sheet, rill, gully, and tunnel erosion. Water erosion is important in assessing the health of the soil and in assessing the soil's potential for different uses. Removal of increasing amounts of soil increasingly alters various properties and capabilities of the soil. Properties and qualities affected include bulk density, permeability, organic matter content, tilth, and water infiltration. Altering these affects the productivity of the soil.

6.1.0 Wind Erosion



High Wind Erosion: Soils with low aggregate stability. Very fine to coarse sand with low organic matter (WEG = 1-2).

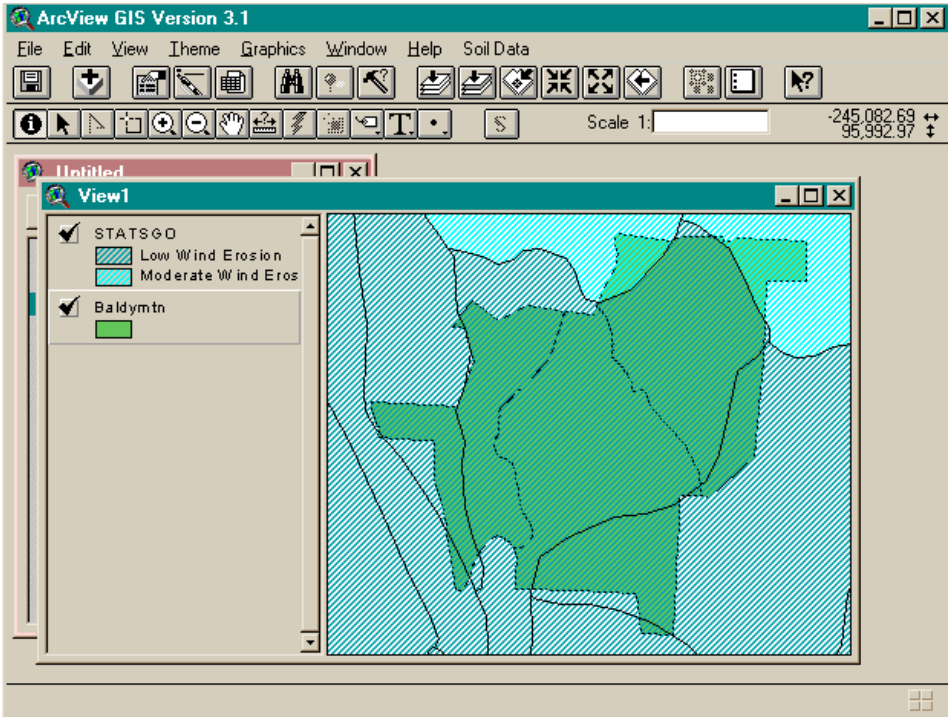
Moderate Wind Erosion: Soils with moderate aggregate stability and moderate organic matter. Very fine sandy loams to noncalcareous loam with less than 20% clay content. (WEG = 3-5).

Low Wind Erosion: Soils with high aggregate stability and high organic matter. Silt loam to silty clay with greater than 20% clay content. (WEG = 6-8).

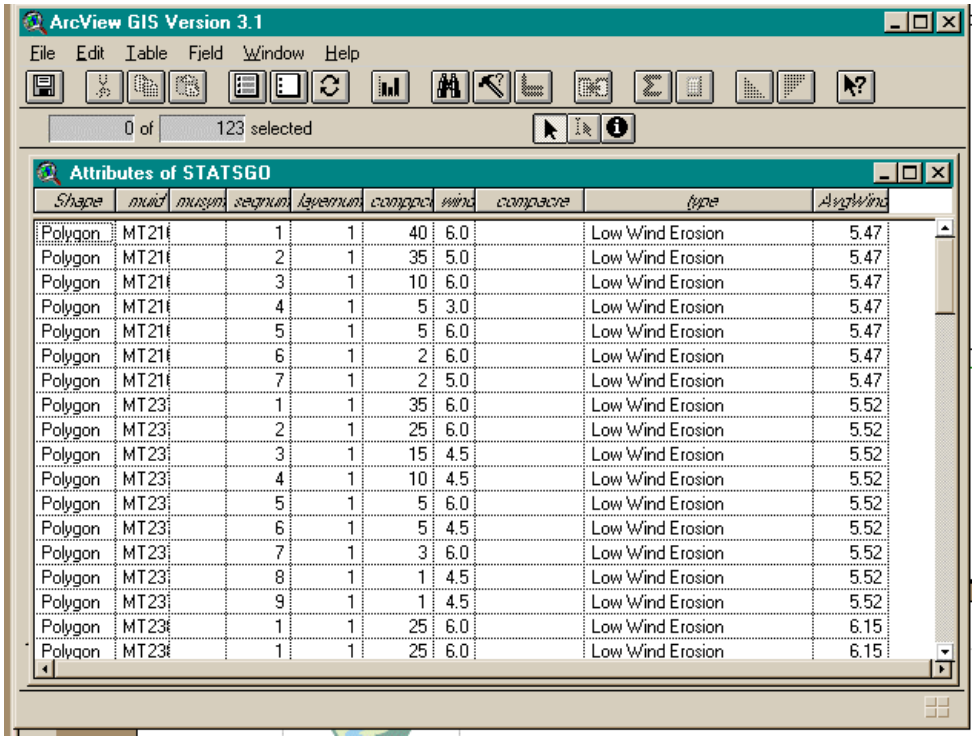
Classified using all Wind Erosion classes: all wind erosion classes (1-8) are classified and displayed.

WEG = Wind Erodibility Group

See Appendix H – Wind Erodibility Groups (WEG) and Index, for more information about WEG class definitions.



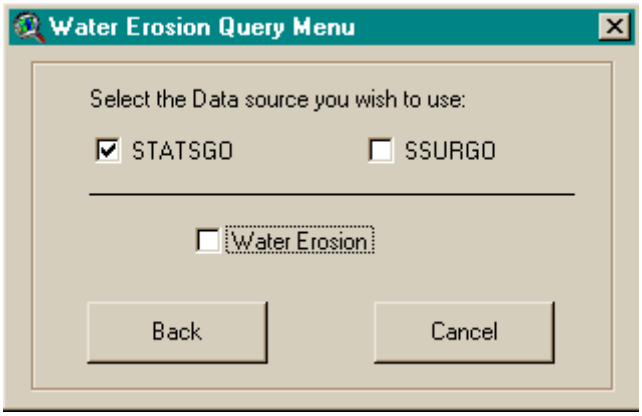
The results of using, *Classified using all Wind Erosion classes*, from the **Wind Query Menu** on the Baldy Mountain Allotment.



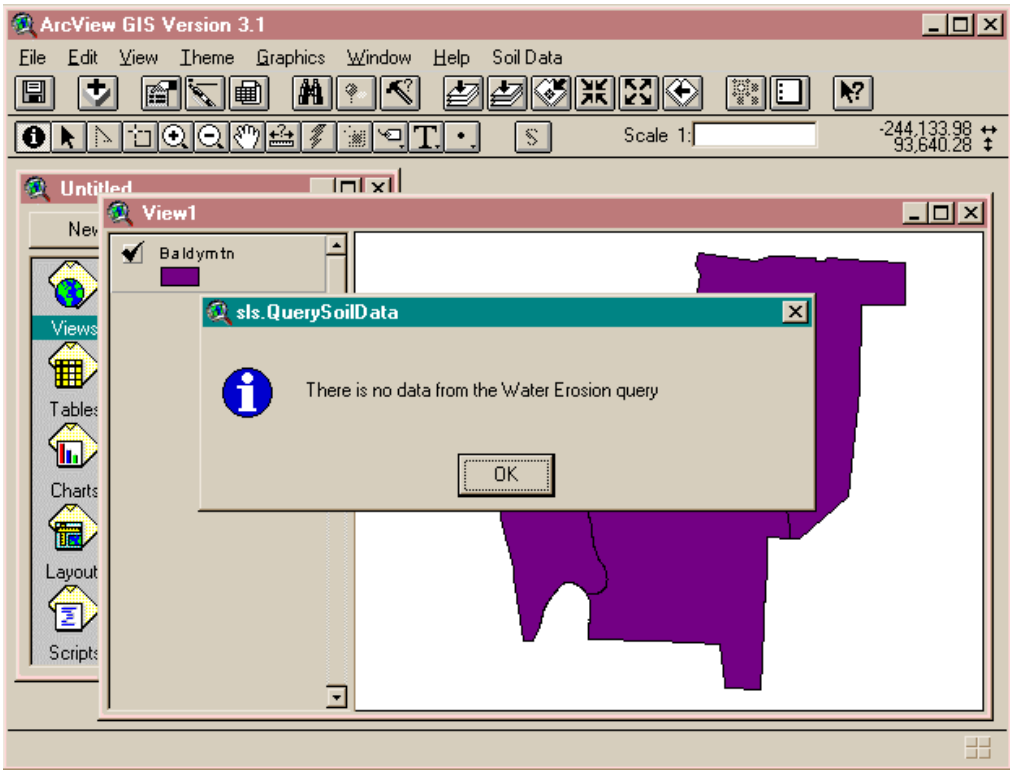
Shape	mukey	musym	seqnum	layernum	compct	wind	compacre	type	Avgwind
Polygon	MT21		1	1	40	6.0		Low Wind Erosion	5.47
Polygon	MT21		2	1	35	5.0		Low Wind Erosion	5.47
Polygon	MT21		3	1	10	6.0		Low Wind Erosion	5.47
Polygon	MT21		4	1	5	3.0		Low Wind Erosion	5.47
Polygon	MT21		5	1	5	6.0		Low Wind Erosion	5.47
Polygon	MT21		6	1	2	6.0		Low Wind Erosion	5.47
Polygon	MT21		7	1	2	5.0		Low Wind Erosion	5.47
Polygon	MT23		1	1	35	6.0		Low Wind Erosion	5.52
Polygon	MT23		2	1	25	6.0		Low Wind Erosion	5.52
Polygon	MT23		3	1	15	4.5		Low Wind Erosion	5.52
Polygon	MT23		4	1	10	4.5		Low Wind Erosion	5.52
Polygon	MT23		5	1	5	6.0		Low Wind Erosion	5.52
Polygon	MT23		6	1	5	4.5		Low Wind Erosion	5.52
Polygon	MT23		7	1	3	6.0		Low Wind Erosion	5.52
Polygon	MT23		8	1	1	4.5		Low Wind Erosion	5.52
Polygon	MT23		9	1	1	4.5		Low Wind Erosion	5.52
Polygon	MT23		1	1	25	6.0		Low Wind Erosion	6.15
Polygon	MT23		1	1	25	6.0		Low Wind Erosion	6.15

Table results from the above *Wind Erosion* query.

6.1.1 Water Erosion



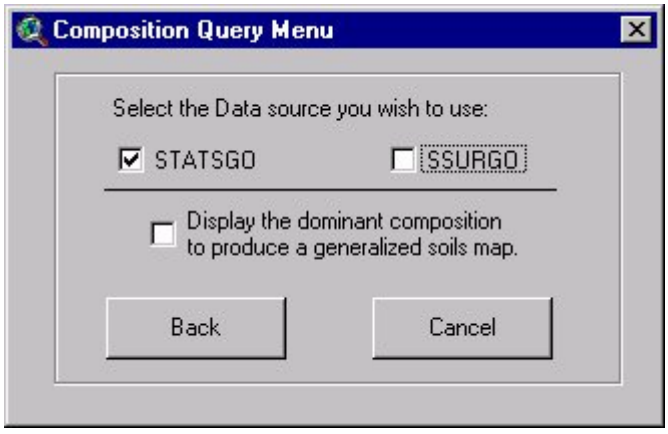
Water Erosion – Soil removal by running water. Can be sheet, rill, gully or tunnel erosion, usually during and immediately following moderate rains or after ice/snow melt.
(kfact >= 0.32 and slope > 10%).

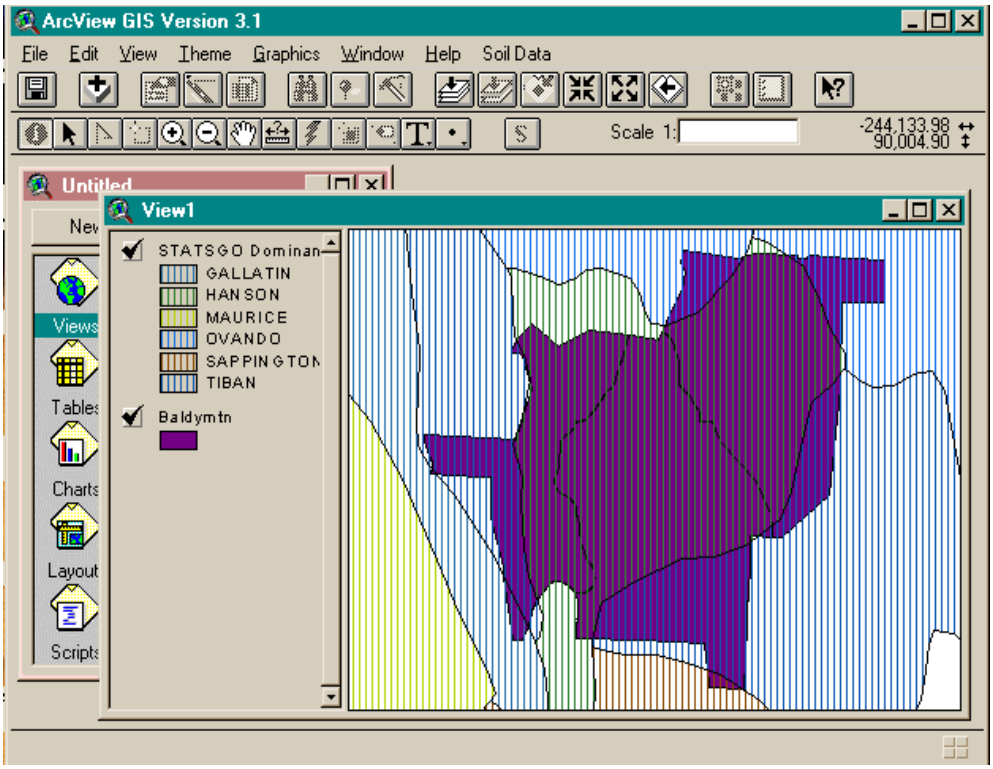


When your area of interest does not contain data that meets the criteria of the query, you will receive the message telling you there is no data from the query.

6.2 Composition

Composition: Displays a general soils map. The legend will be classified by Dominant Soil Components, but all the components are available in the attribute table.





This is the result of using the *Display the dominant composition to produce a generalized soils map*, from the **Composition Query Menu** for the Baldy Mountain Allotment.

Attributes of STATSGO Dominant Composition

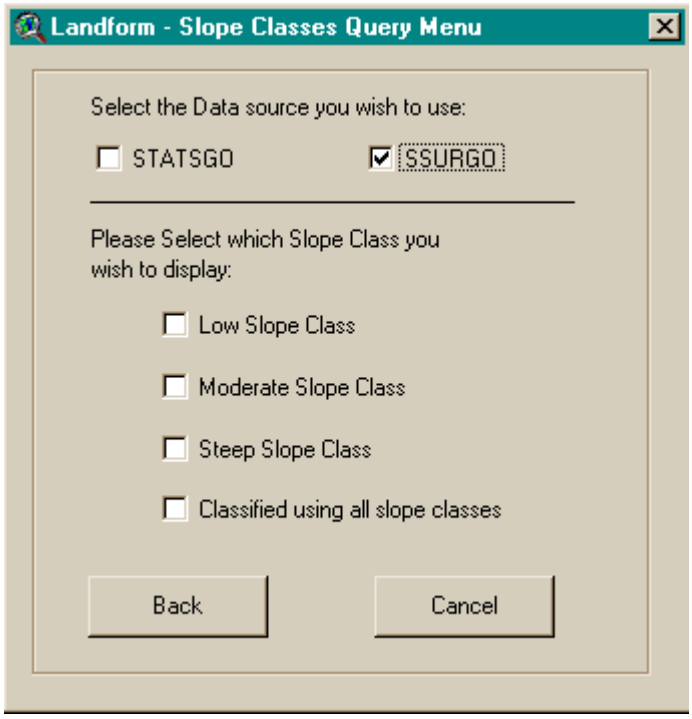
Shape	mukl	seqnum	layernum	kfact	compname	compct	Domname
Polygon	MT436	1	1	0.15	OVANDO	20	OVANDO
Polygon	MT436	1	2	0.05	OVANDO	20	OVANDO
Polygon	MT436	1	3	0.05	OVANDO	20	OVANDO
Polygon	MT436	1	4	0.02	OVANDO	20	OVANDO
Polygon	MT436	2	1	0.15	OVANDO	15	OVANDO
Polygon	MT436	2	2	0.05	OVANDO	15	OVANDO
Polygon	MT436	2	3	0.05	OVANDO	15	OVANDO
Polygon	MT436	2	4	0.02	OVANDO	15	OVANDO
Polygon	MT436	3	1	0.10	ELKNER	15	OVANDO
Polygon	MT436	3	2	0.10	ELKNER	15	OVANDO
Polygon	MT436	3	3	0.05	ELKNER	15	OVANDO
Polygon	MT436	3	4	0.02	ELKNER	15	OVANDO
Polygon	MT436	4	1	0.10	SHADOW	10	OVANDO
Polygon	MT436	4	2	0.05	SHADOW	10	OVANDO
Polygon	MT436	4	3	0.05	SHADOW	10	OVANDO
Polygon	MT436	4	4	0.05	SHADOW	10	OVANDO

This is part of the table results from the above **Composition** query.

(See Appendix D – Queries Defined for more information about these results.)

6.3 Landform – Slope Classes

Slope: Slope gradient is the difference in elevation between two points and is expressed as a percentage of the distance between those points. For example, a difference in elevation of 1 meter over a horizontal distance of 100 meters is a slope of 1 percent. Slope gradient influences the retention and movement of water, the potential for soil slippage and accelerated erosion, the ease with which machinery can be used, soil-water states, and the engineering uses of the soil.

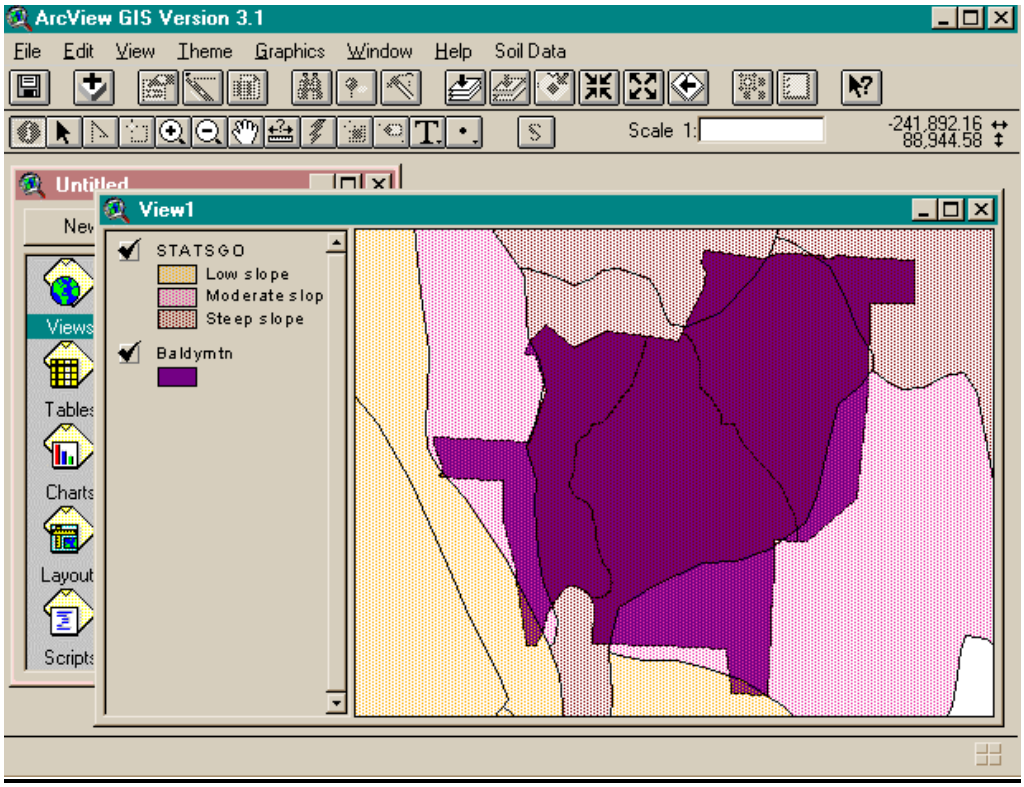


Low Slope Class: 0% to 9%

Moderate Slope Class: 9% to 25%

Steep Slope Class: greater than 25%

Classified using all slope classes: All slope classes are displayed



The results of using, *Classified using all slope classes*, from the **Landform – Slope Classes Query Menu** on the Baldy Mountain Allotment.

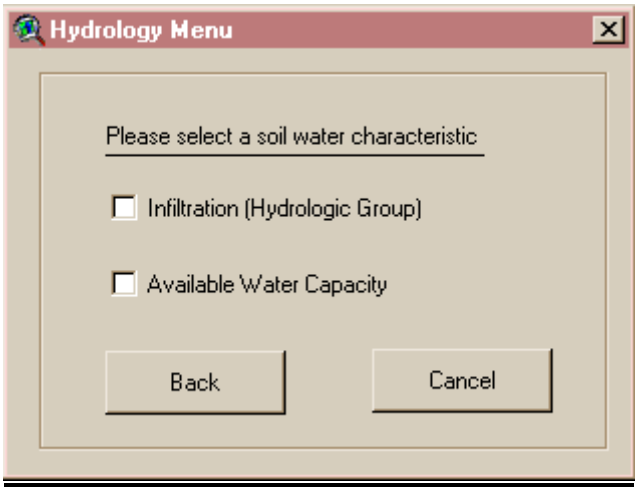
Attributes of STATSGO

Shape	muid	muspm	segnum	compac	avgslope	compacre	type
Polygon	MT21		1	40	2		Low slope
Polygon	MT21		2	35	2		Low slope
Polygon	MT23		1	25	25		Steep slope
Polygon	MT38		1	25	8		Low slope
Polygon	MT43		1	20	48		Steep slope
Polygon	MT43		2	15	23		Steep slope
Polygon	MT43		3	15	25		Steep slope
Polygon	MT43		1	25	25		Steep slope
Polygon	MT51		1	25	5		Low slope
Polygon	MT51		2	20	5		Low slope
Polygon	MT57		1	30	19		Moderate slope
Polygon	MT57		1	30	19		Moderate slope

Table results from the above **Landform – Slope** query.

6.4 Soil Water Characteristics

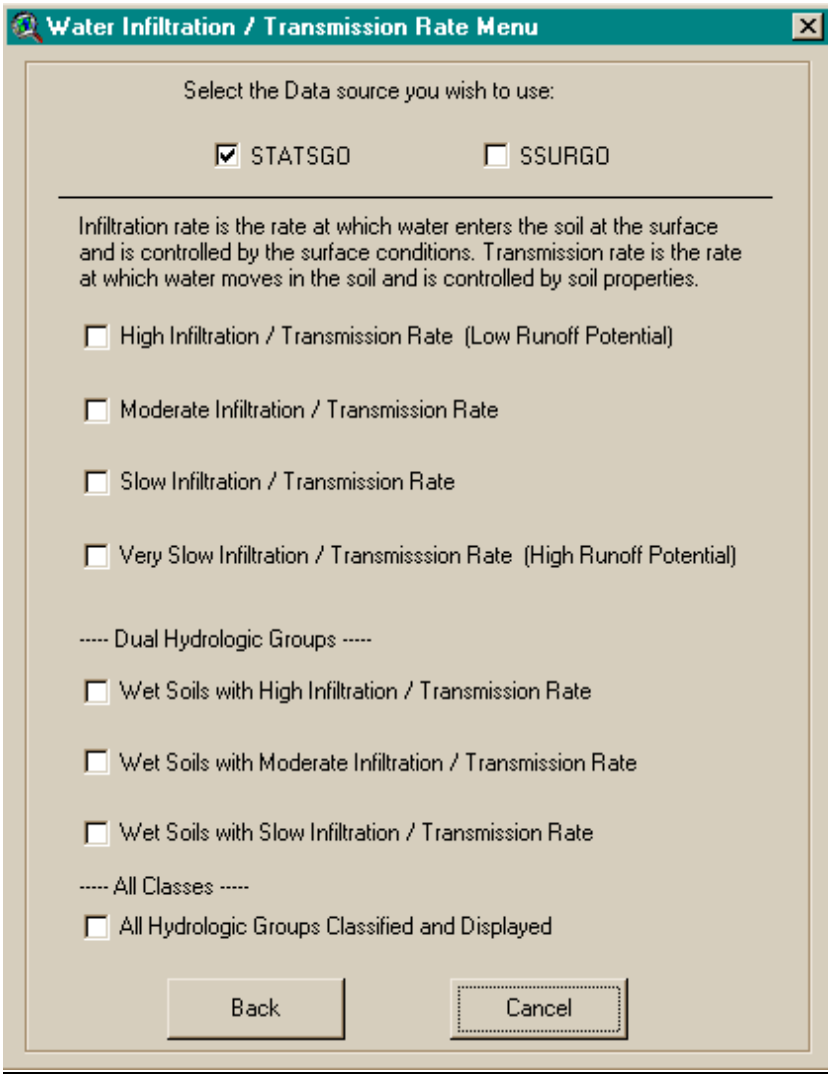
Soil Water Characteristics: Infiltration (Hydrologic Groups) and Available Water Capacity provide information about a soil's ability to retain water, potential for flooding, runoff, infiltration and transmission rate.



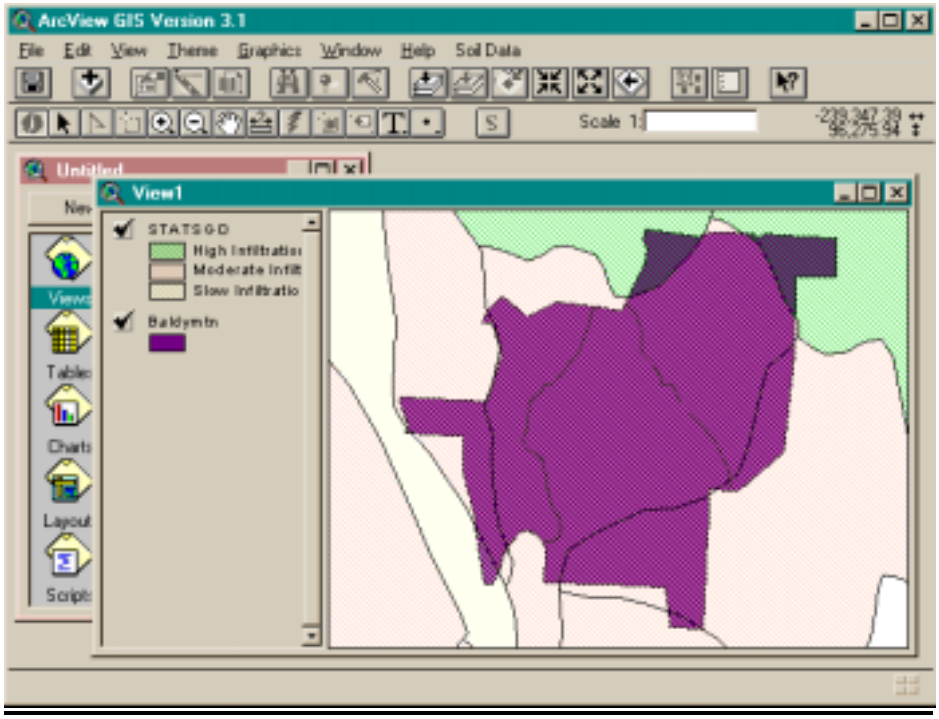
Infiltration (Hydrologic Group): Hydrologic Groups are defined as groups of soils having similar runoff potential under similar storm and cover conditions. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonally high water table, intake rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The influence of ground cover is treated independently.

Available Water Capacity: is the volume of water that should be available to plants if the soil, inclusive of fragments, were at field capacity. It is commonly estimated as the amount of water held between field capacity and wilting point, with corrections for salinity, fragments, and rooting depth.

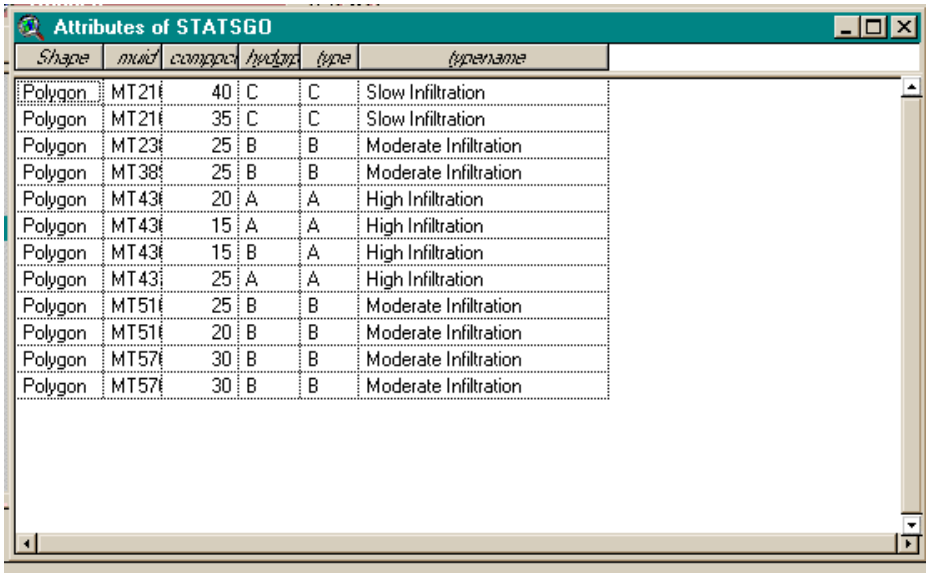
6.4.0 Water Infiltration / Transmission Rate (Hydrologic Group)



High Infiltration: Class A. (low runoff potential). The soils have a high infiltration rate even when thoroughly wetted. They chiefly consist of deep, well drained to excessively drained sands or gravels. They have a high rate of water transmission.
Moderate Infiltration: Class B. The soils have a moderate infiltration rate when thoroughly wetted. They chiefly are moderately deep to deep, moderately well drained to well drained soils that have moderately fine to moderately coarse textures. They have a moderate rate of water transmission.
Slow Infiltration: Class C. The soils have a slow infiltration rate when thoroughly wetted. They chiefly have a layer that impedes downward movement of water or have moderately fine to fine texture. They have a slow rate of water transmission.
Very Slow Infiltration: Class D (high runoff potential). The soils have a very slow infiltration rate when thoroughly wetted. They chiefly consist of clay soils that have a high swelling potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. They have a very slow rate of water transmission.
Wet Soils with High Infiltration: Class A/D. Wet soils with a high infiltration rate. They chiefly consist of deep, well drained to excessively drained sands or grovels.
Wet Soils with Moderate Infiltration: Class B/D. Wet soils with a moderate infiltration rate. They chiefly are moderately deep to deep, moderately well drained to well drained soils that have moderately fine to moderately coarse textures.
Wet Soils with Slow Infiltration: Class C/D. Wet soils with a slow infiltration rate. They chiefly have a layer that impedes downward movement of water or have moderately fine to fine texture.
All Hydrologic Groups Classified and Displayed: All Hydrologic Groups Classified and Displayed.



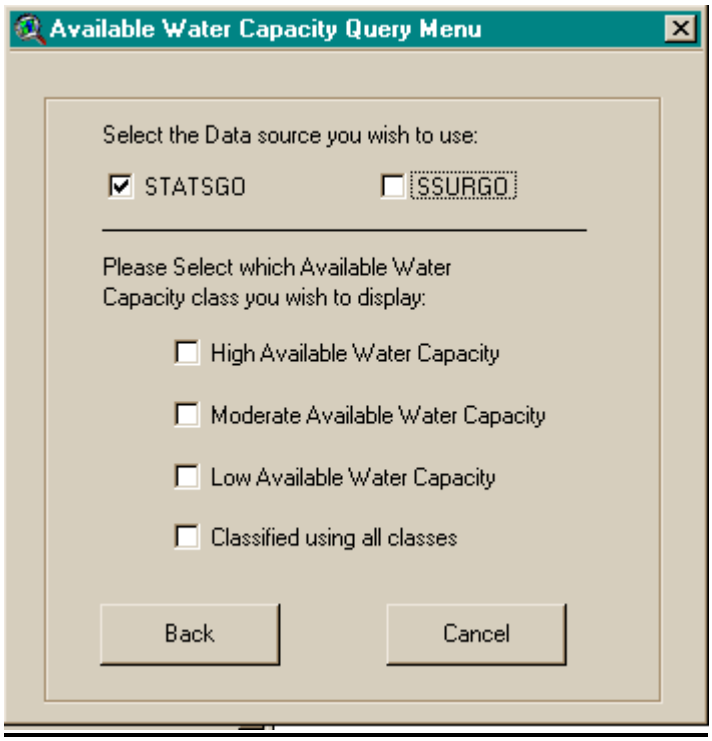
The results of using, *All Hydrologic Groups Classified and Displayed* from the **Water Infiltration/ Transmission Rate Query Menu** on the Baldy Mountain Allotment.



Shape	muid	compct	hydgrp	type	typename
Polygon	MT21	40	C	C	Slow Infiltration
Polygon	MT21	35	C	C	Slow Infiltration
Polygon	MT23	25	B	B	Moderate Infiltration
Polygon	MT38	25	B	B	Moderate Infiltration
Polygon	MT43	20	A	A	High Infiltration
Polygon	MT43	15	A	A	High Infiltration
Polygon	MT43	15	B	A	High Infiltration
Polygon	MT43	25	A	A	High Infiltration
Polygon	MT51	25	B	B	Moderate Infiltration
Polygon	MT51	20	B	B	Moderate Infiltration
Polygon	MT57	30	B	B	Moderate Infiltration
Polygon	MT57	30	B	B	Moderate Infiltration

Table results from the above **Water Infiltration/ Transmission Rate** query.

6.4.1 Available Water Capacity Query Menu

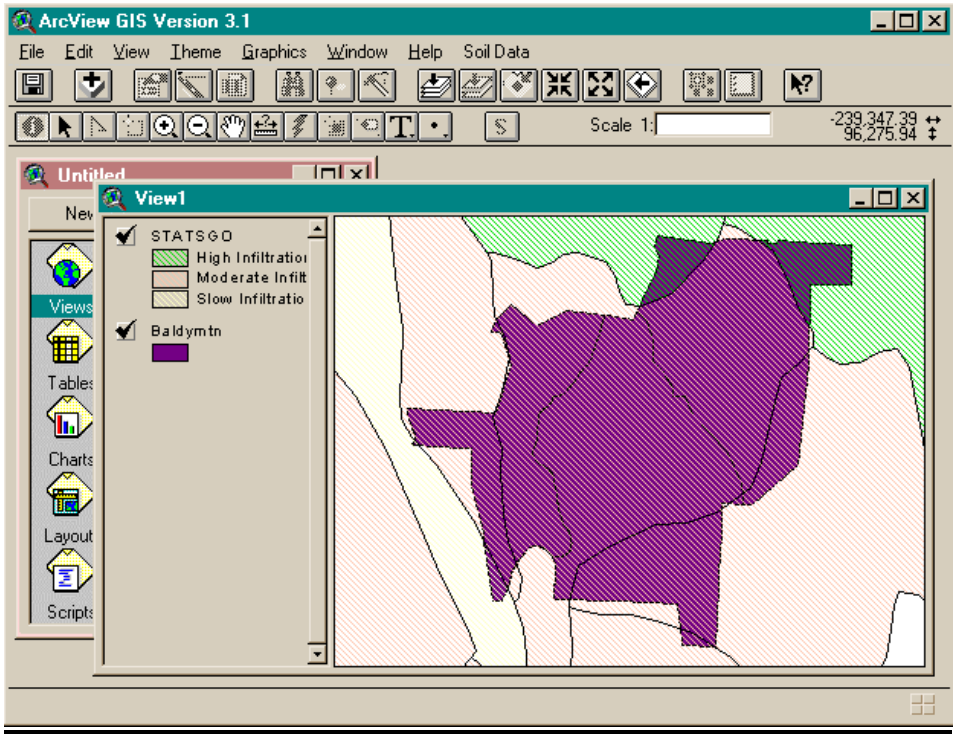


High Available Water Capacity: High Available Water Capacity (weighted average AWC >= 0.10)

Moderate Available Water Capacity: Moderate Available Water Capacity (weighted average AWC >= 0.05 and < 0.10)

Low Available Water Capacity: Low Available Water Capacity (weighted average AWC < 0.05)

Classified using all classes: All Available Water Capacity classes displayed.



The results of using *Classified using all classes* from the **Available Water Capacity Query Menu**, for the Baldy Mountain Allotment.

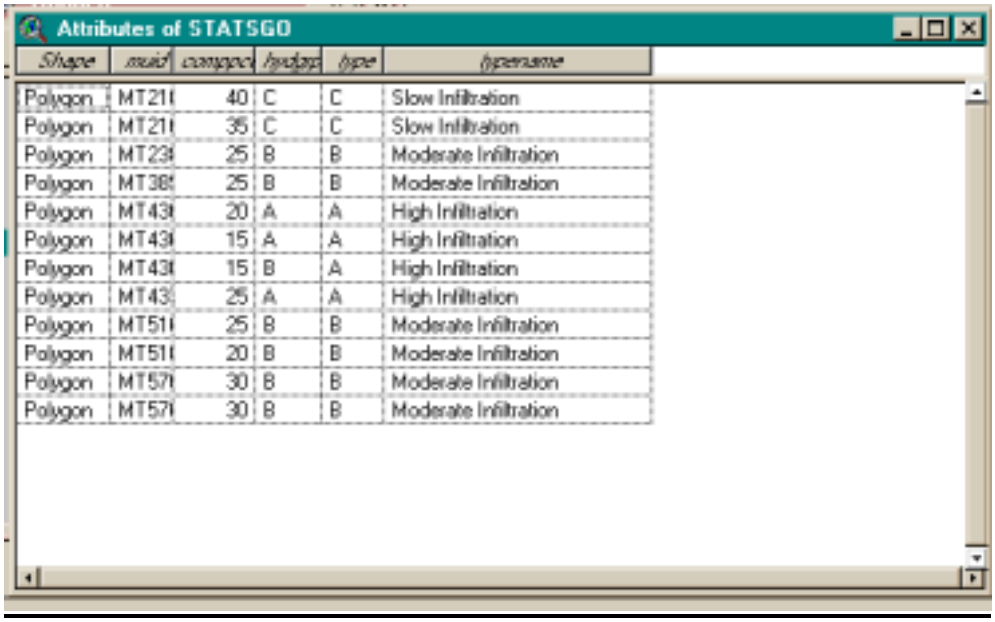
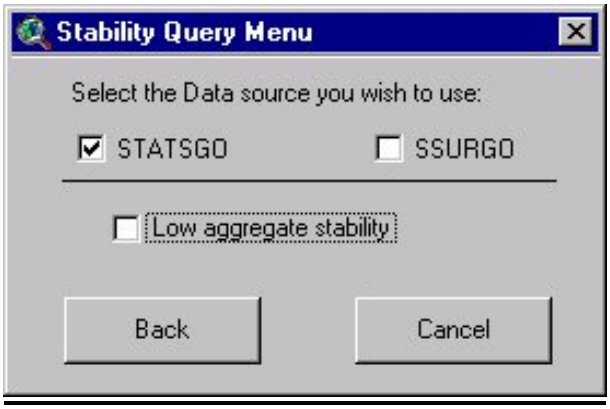


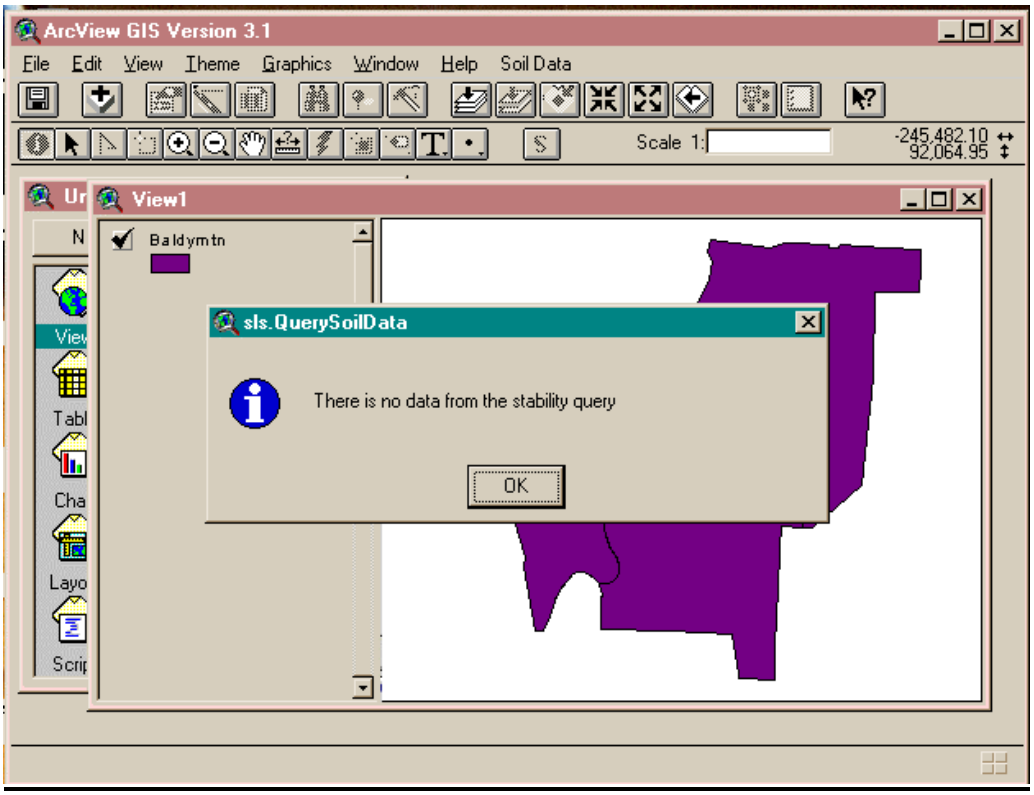
Table results from the above **Available Water Capacity** menu query.

6.5 Stability

Stability: Displays soils with Low Aggregate Stability.



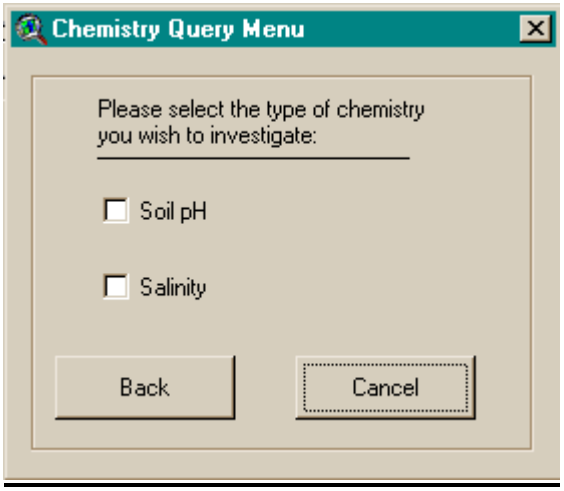
Low aggregates stability: Soils with Low aggregate stability. Very fine to coarse sand with low organic matter. [(avg Perm < 0.2) + (avg OM < 1.0) + (avg sal > 8.0) + (avg pH > 8.4) + (layer = 1)]



When your area of interest does not contain data that meets the criteria of the query, you will receive the message telling you there is no data from the query.

6.6 Chemistry

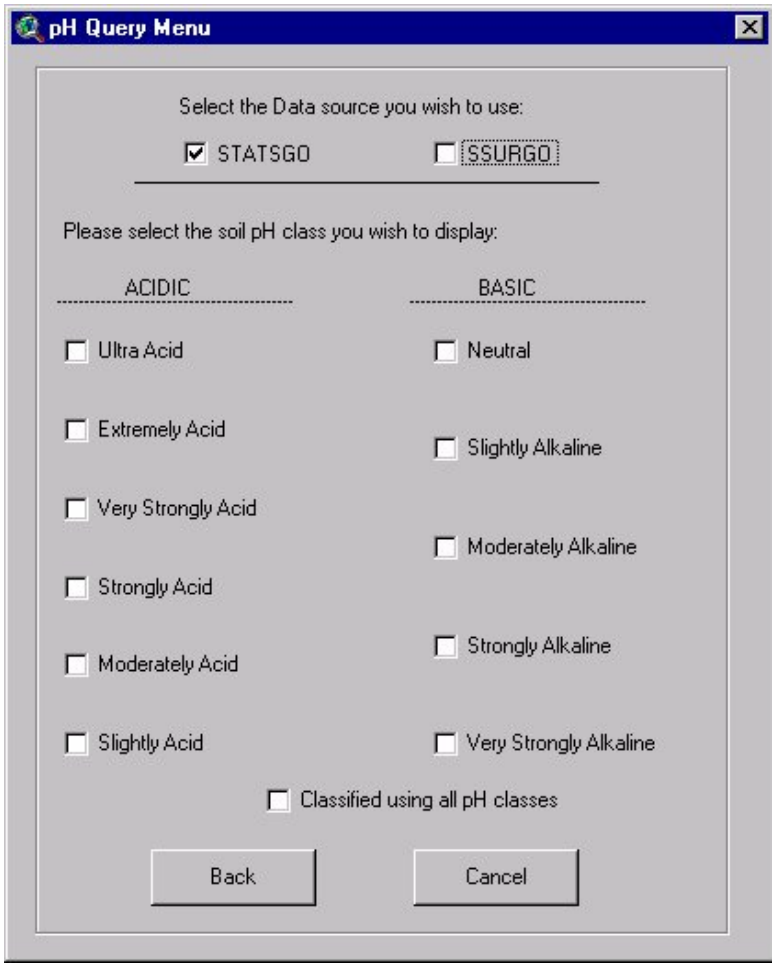
Chemistry: The chemical composition of the soil. Contains soil pH queries, and soil salinity queries.



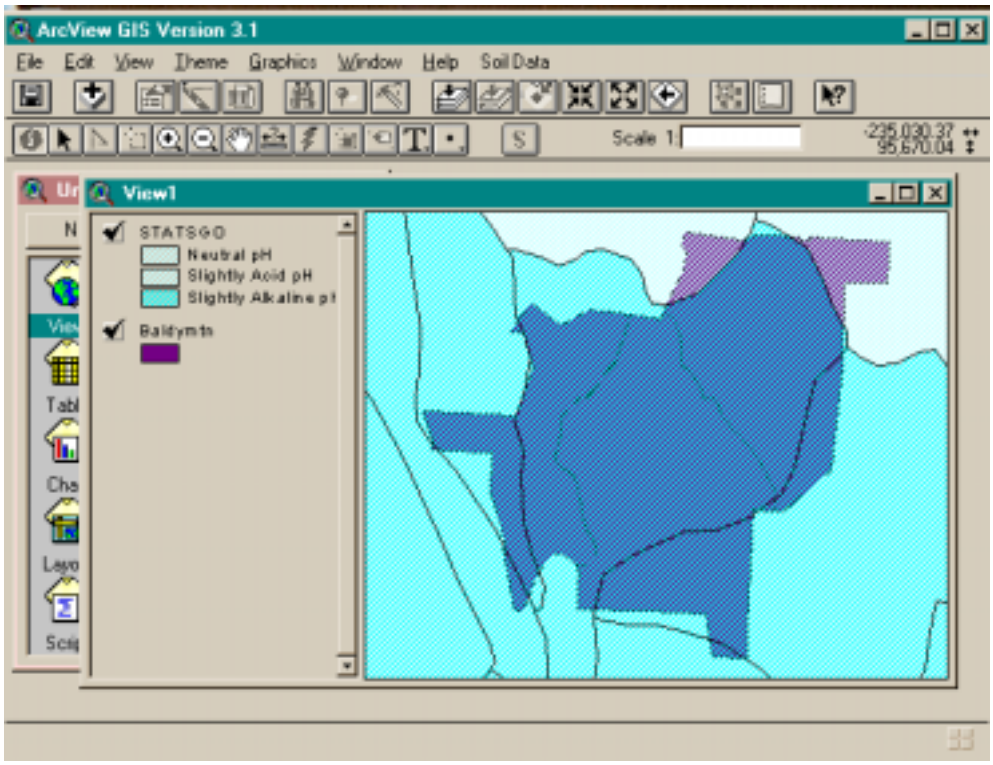
Soil pH: Soil pH is a numerical expression of the relative acidity or alkalinity of a soil. Soils that have a pH of approximately 6 or 7 generally have the most readily available of plant nutrients. Strongly acid or more acid soils have low extractable calcium and magnesium, a high solubility of aluminum, iron, and boron, and a low solubility of molybdenum. At the other extreme are alkaline soils. If pH is above 7.9, the soils may have an inadequate availability of iron, manganese, copper, zinc, and phosphorus.

Salinity: A measure of the concentration of water-soluble salts in soils. High concentrations of neutral salts, such as sodium chloride and sodium sulfate, may interfere with the absorption of water by plants because the osmotic pressure in the soil solution is nearly as high or higher than that in the plant cells. Salts may also interfere with the exchange capacity of nutrient ions, thereby resulting in nutritional deficiencies in plants.

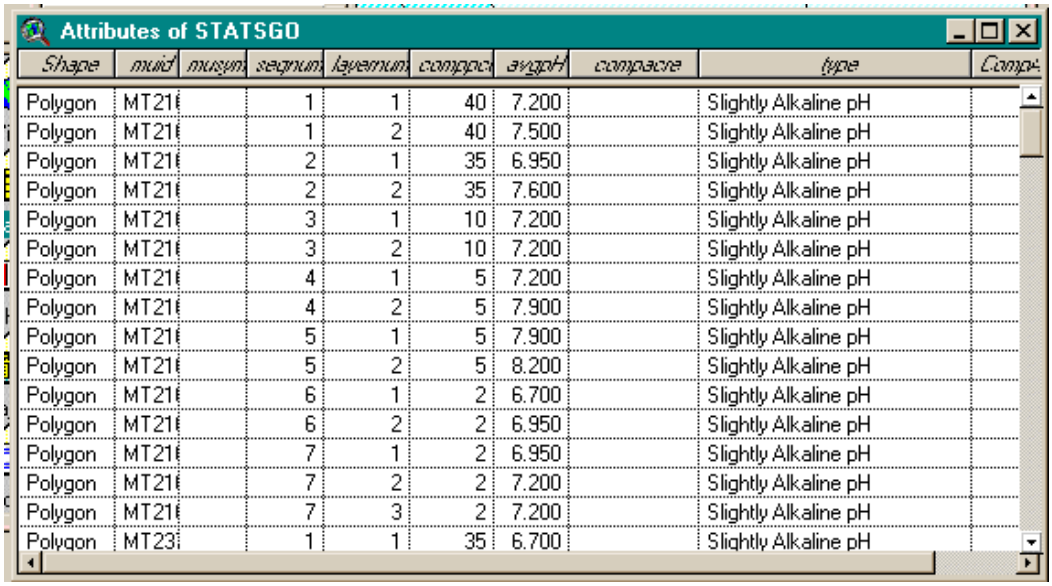
6.6.8 Soil pH



Ultra Acid: pH 1.8 – 3.4
Extremely Acid: pH 3.5 – 4.4
Very Strong Acid: pH 4.5 – 5.0
Strongly Acid: pH 5.1 – 5.5
Moderately Acid: pH 5.6 – 6.0
Slightly Acid: pH 6.1 – 6.5
Neutral: pH 6.6 – 7.3
Slightly Alkaline: pH 7.4 – 7.8
Moderately Alkaline: pH 7.9 – 8.4
Strongly Alkaline: pH 8.5 – 9.0
Very Strongly Alkaline: 9.1 – 11.0
Classified using all pH Classes: Uses all of the above pH classes



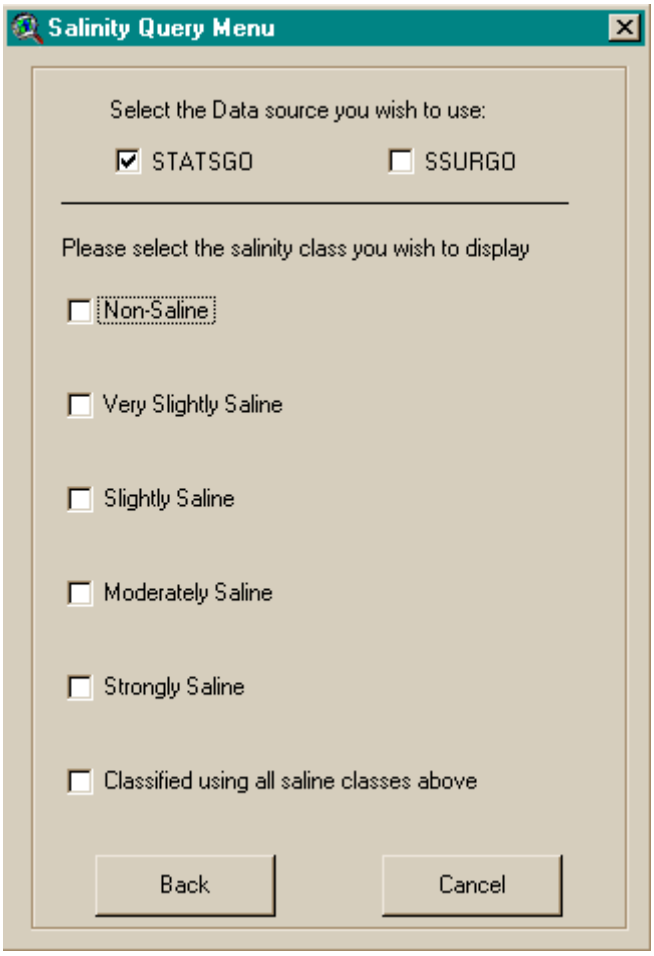
The results of using *Classified using all pH classes*, from the **pH Query Menu**, for the Baldy Mountain Allotment.



Shape	mukey	musym	seqnum	layernum	compct	avgpH	compacre	type	Comp
Polygon	MT21		1	1	40	7.200		Slightly Alkaline pH	
Polygon	MT21		1	2	40	7.500		Slightly Alkaline pH	
Polygon	MT21		2	1	35	6.950		Slightly Alkaline pH	
Polygon	MT21		2	2	35	7.600		Slightly Alkaline pH	
Polygon	MT21		3	1	10	7.200		Slightly Alkaline pH	
Polygon	MT21		3	2	10	7.200		Slightly Alkaline pH	
Polygon	MT21		4	1	5	7.200		Slightly Alkaline pH	
Polygon	MT21		4	2	5	7.900		Slightly Alkaline pH	
Polygon	MT21		5	1	5	7.900		Slightly Alkaline pH	
Polygon	MT21		5	2	5	8.200		Slightly Alkaline pH	
Polygon	MT21		6	1	2	6.700		Slightly Alkaline pH	
Polygon	MT21		6	2	2	6.950		Slightly Alkaline pH	
Polygon	MT21		7	1	2	6.950		Slightly Alkaline pH	
Polygon	MT21		7	2	2	7.200		Slightly Alkaline pH	
Polygon	MT21		7	3	2	7.200		Slightly Alkaline pH	
Polygon	MT23		1	1	35	6.700		Slightly Alkaline pH	

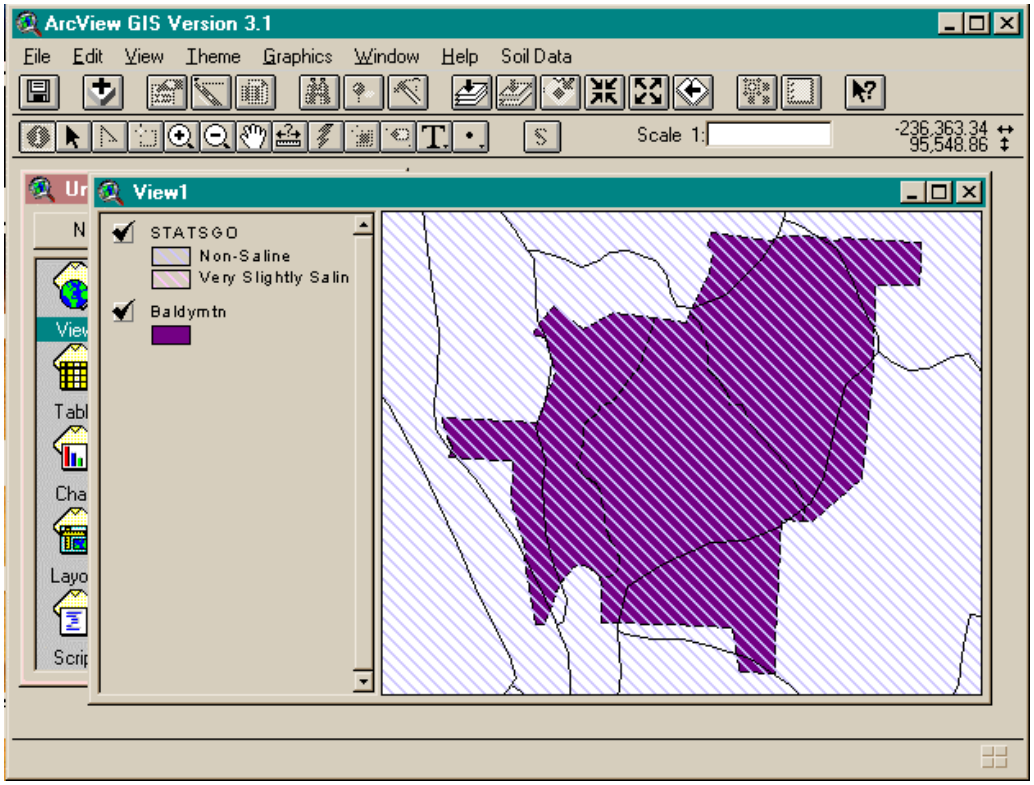
Table results from the above **pH** query**.**

6.6.1 Salinity

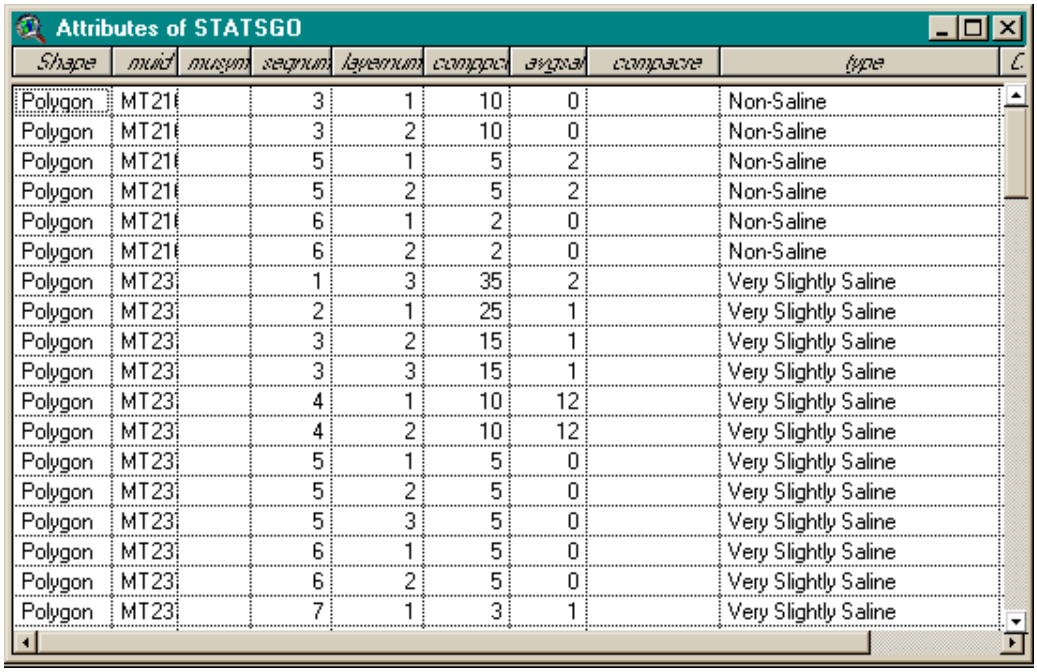


Non-Saline: < 2 mmhos/cm.
Very Slightly Saline: 2 to < 4 mmhos/cm
Slightly Saline: 4 to < 8 mmhos/cm
Moderately Saline: 8 to < 16 mmhos/cm
Strongly Saline: >= 16 mmhos/cm
Classified using all saline classes above:
Displays all saline classes in a color coded display.

The electrolytic conductivity of a saturated extract is the standard measure used to express salinity as millimhos per centimeter (mmhos cm-1) at 25 degrees C.



The results of using *Classified using all saline classes above*, from the **Salinity Query Menu**, for the Baldy Mountain Allotment.



Shape	mukey	muacres	seqnum	layernum	compct	avgpct	compacre	type
Polygon	MT21		3	1	10	0		Non-Saline
Polygon	MT21		3	2	10	0		Non-Saline
Polygon	MT21		5	1	5	2		Non-Saline
Polygon	MT21		5	2	5	2		Non-Saline
Polygon	MT21		6	1	2	0		Non-Saline
Polygon	MT21		6	2	2	0		Non-Saline
Polygon	MT23		1	3	35	2		Very Slightly Saline
Polygon	MT23		2	1	25	1		Very Slightly Saline
Polygon	MT23		3	2	15	1		Very Slightly Saline
Polygon	MT23		3	3	15	1		Very Slightly Saline
Polygon	MT23		4	1	10	12		Very Slightly Saline
Polygon	MT23		4	2	10	12		Very Slightly Saline
Polygon	MT23		5	1	5	0		Very Slightly Saline
Polygon	MT23		5	2	5	0		Very Slightly Saline
Polygon	MT23		5	3	5	0		Very Slightly Saline
Polygon	MT23		6	1	5	0		Very Slightly Saline
Polygon	MT23		6	2	5	0		Very Slightly Saline
Polygon	MT23		7	1	3	1		Very Slightly Saline

Table results from the above **Salinity** query**.**

7.0 Rangeland Management Soil Queries

The Rangeland Management soil queries are designed to be generalized queries to provide soil and accompanying setting, health and information to support rangeland health and management activities. The queries provide dominant soil and setting information that strongly influences the suitability, resilience and sustainability of rangelands. The queries are designed to interpret soils as a plant growth medium for semi-arid and arid rangeland areas. They are generalized to accommodate different kinds of soil map units commonly used in 2nd and 3rd order soil surveys. The principle that distinguishes between a soil taxonomic unit and a soil mapping unit is highly important. Unless it is understood clearly, soil surveys on rangelands cannot be understood nor can they be used properly.

7.1 Kinds of Soil Map Units

Soils differ in the size and shape of their areas, in their degree of contrast with adjacent soils, and in their geographic relationships. Four kinds of map units are used in soil surveys to distinguish the different relationships: consociations, complexes and associations, undifferentiated groups, and miscellaneous areas.

Consociations. In a consociation, delineated areas are dominantly a single soil taxon (or miscellaneous area) and similar soils.

Complexes and Associations. Complexes and associations consist of two or more dissimilar components that occur in a regularly repeating pattern. Only the following arbitrary rule that is related to mapping scale determines whether "complex" or "association" is used in the name.

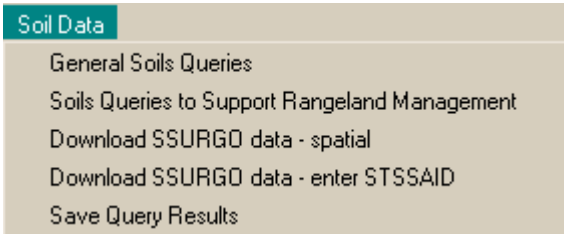
Undifferentiated. Undifferentiated groups consist of two or more taxa components that are not consistently associated geographically and, therefor, do not always occur together in the same map delineation.

Miscellaneous Areas. Miscellaneous areas have essentially no soil and support little or no vegetation. They can result from active erosion, washing by water, unfavorable soil conditions, or human activities.

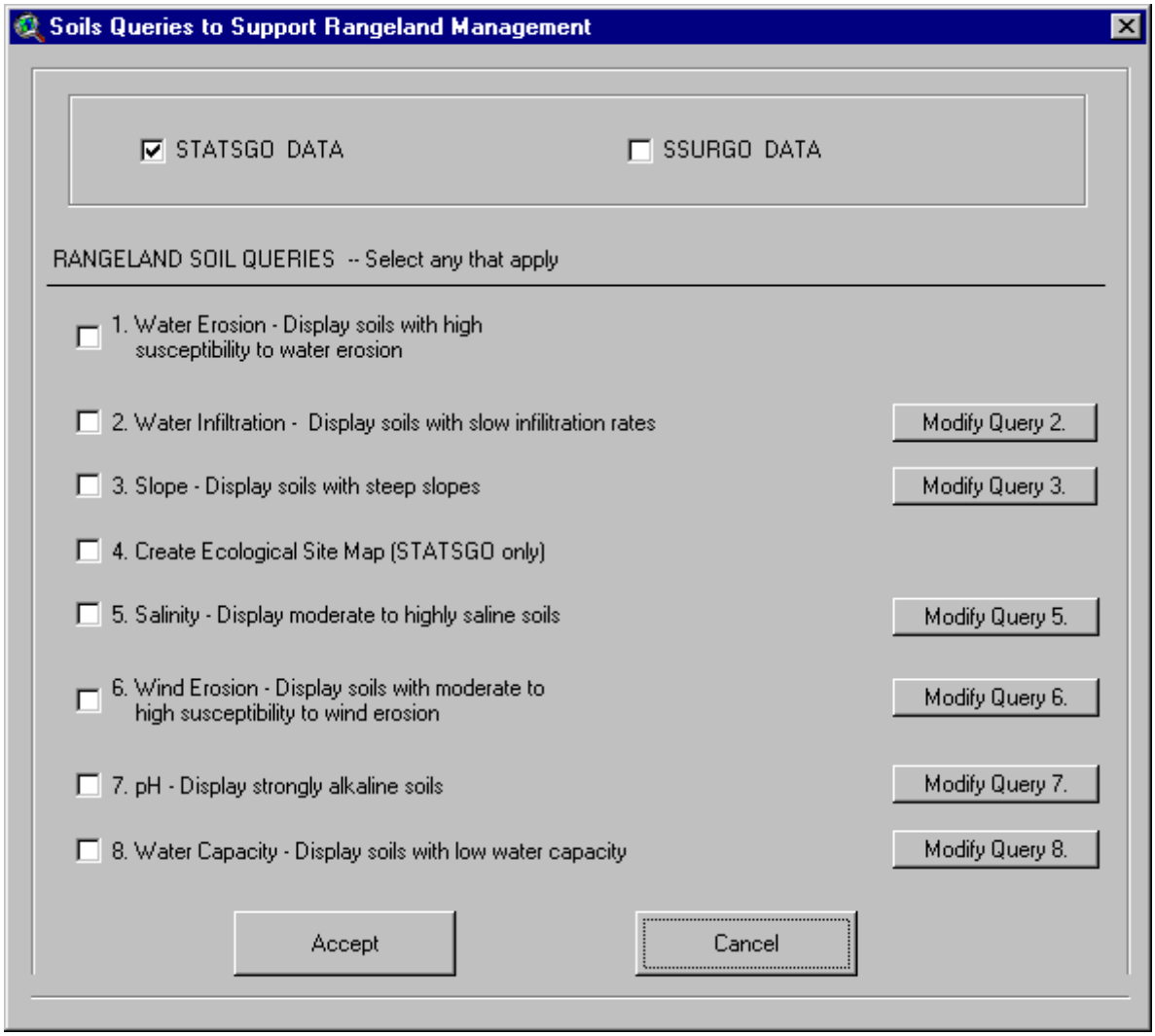
Examples are:

- Badlands
- Blown-out land
- Dune land
- Playas
- Riverwash
- Rock Outcrop
- Rubble land
- Salt Flats

7.2 Running the Soils Queries to Support Rangeland Management



From the **Soil Data** menu select the choice **Soils Queries to Support Rangeland Management**.



The first time you try to run a query, the Soils Extension dialog box will come up prompting you to identify the location of: 1) where you unzipped the WinZip file and 2) the location of your temporary directory. Please see Appendix B – SSE Preference File for more information.

Like the General Soils Menu, this menu will display informative text when the mouse cursor is place over a check box. You must select "STATSGO" or "SSURGO" and then select as many of the queries as you like. To initiate the queries, you must click the "Accept" button at the bottom of the dialog box. To cancel the process, click "Cancel". The "modify" buttons at the side of each query will bring you to a more detailed dialog box that contains more selections. These rangeland queries are more specific in nature than the general queries. Experiment with them to gain an understanding of their capability.

7.2.0 Query 1. Water Erosion – Display soils with high susceptibility to water erosion

Water erosion results from the movement and the removal of soil materials by flowing water. Part of the impact is the detachment of soil particles by the impact of raindrops. The soil material is suspended in runoff water and carried away. Four kinds of accelerated water erosion commonly recognized are sheet, rills, gully, and tunnel (piping).

K Factor is an erodibility factor which is adjusted for the effect of rock fragments.

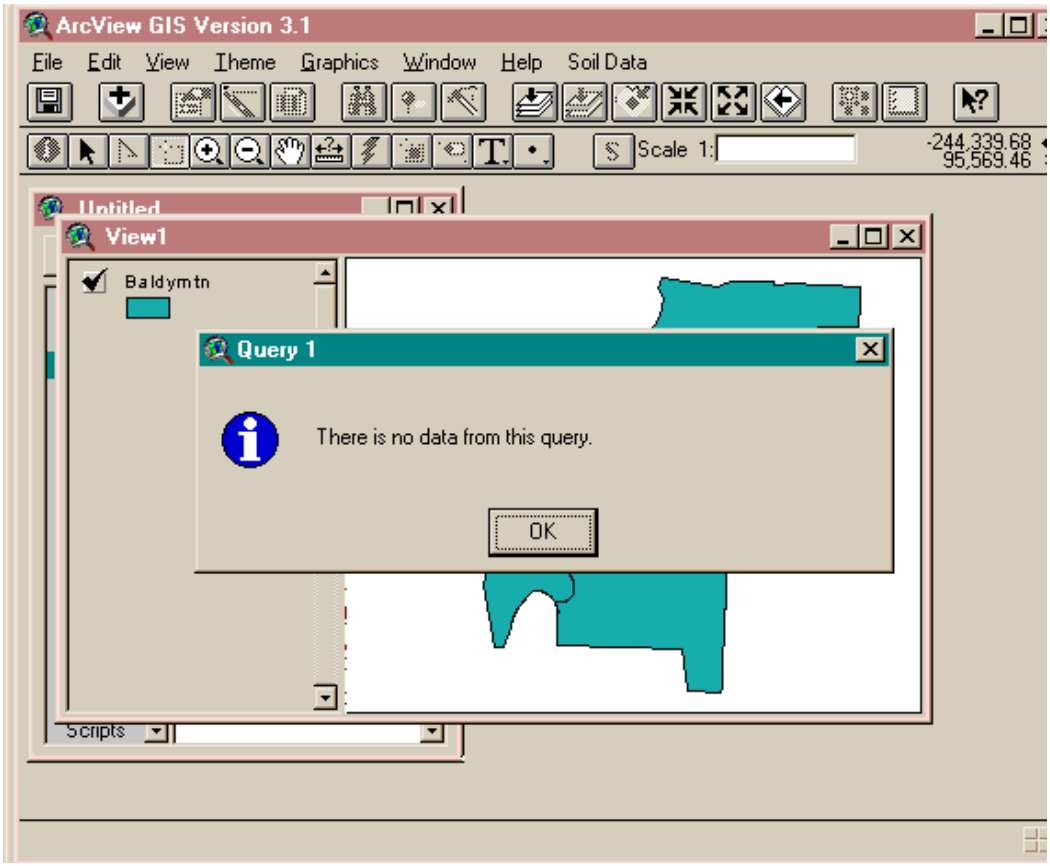
Default: k factor of .32 and greater, and on slopes greater than 10 percent.

Classes: K factors obtained experimentally vary from 0.02 to 0.69. For the purpose of soil interpretations, the factors have been grouped into 14 classes. The classes are identified by a representative class value as follows: .02, .05, .10, .15, .17, .20, .24, .28, .32, .37, .43, .49., .55, and .64.

Significance: Soil properties that influence rainfall erosion are (1) those that affect infiltration rate, movement of water through the soil, and water storage capacity and (2) those that affect dispersion, detachability, abrasion, and mobility of soil particles by rainfall and runoff. Some of the most important properties are texture, organic matter content, size and stability of structural aggregates in the exposed layer, permeability of the subsoil, and depth to a slowly permeable layer.

Modify Query 1: Not applicable for this query

Example:



When your area of interest does not contain data that meets the criteria of the query, you will receive the message telling you there is no data from the query.

7.2.1 Query 2. Water Infiltration – Display soils with slow infiltration rates

Water infiltration is expressed as a hydrologic group class. Hydrologic condition is a group of soils having the same runoff potential under similar storm and cover conditions. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonally high water table, intake rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The influence of ground cover is treated independently, not in hydrologic soil conditions.

In the definitions of the classes, infiltration rate is the rate at which water enters the soil at the surface and is controlled by the surface conditions. Transmission rate is the rate at which water moves in the soil and is controlled by the soil properties.

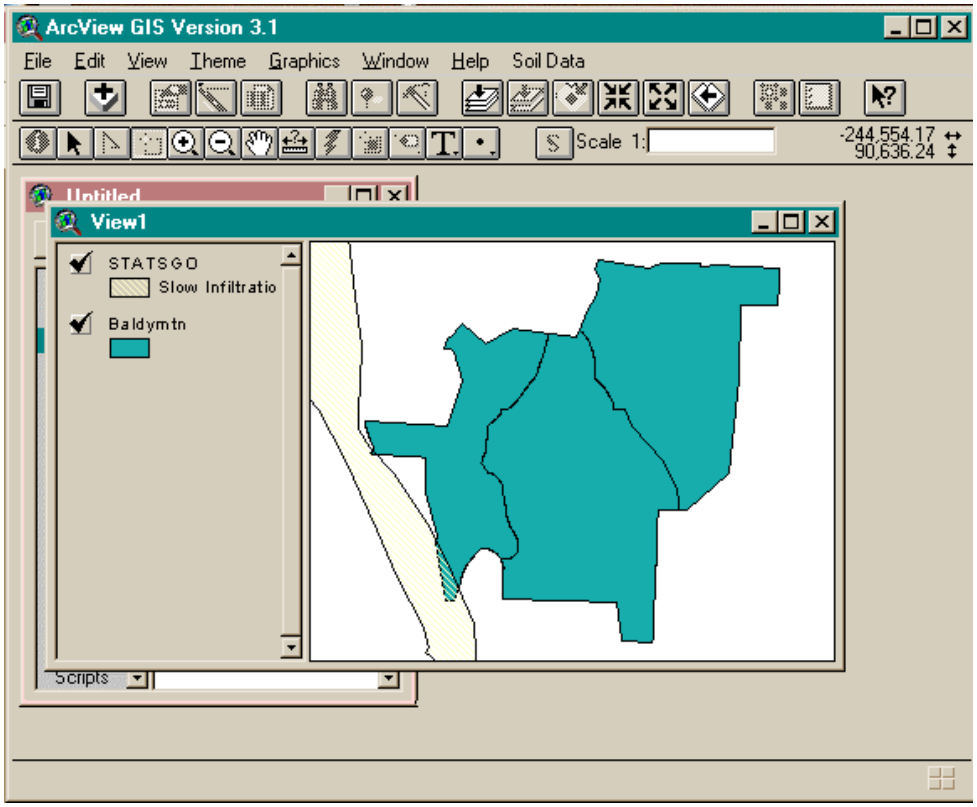
Default: Class C or D.

Classes: These classes are defined under the General Soil Queries, Soil Water Characteristics, Infiltration (Hydrologic Group).

Significance: Hydrologic groups are used in equations that estimate runoff from rainfall. These estimates are needed for solving hydrologic problems that arise in planning watershed - protection and flood - prevention projects and for planning or designing structures for the use, control, and disposal of water.

Modify Query 2: Displays the Water Infiltration/Transmission Rate Menu from the General Soils Queries Menu.

Example:



The results of running **Query 2 Water Infiltration**, on the Baldy Mountain Allotment. Only a small portion of this allotment has poor water infiltration.

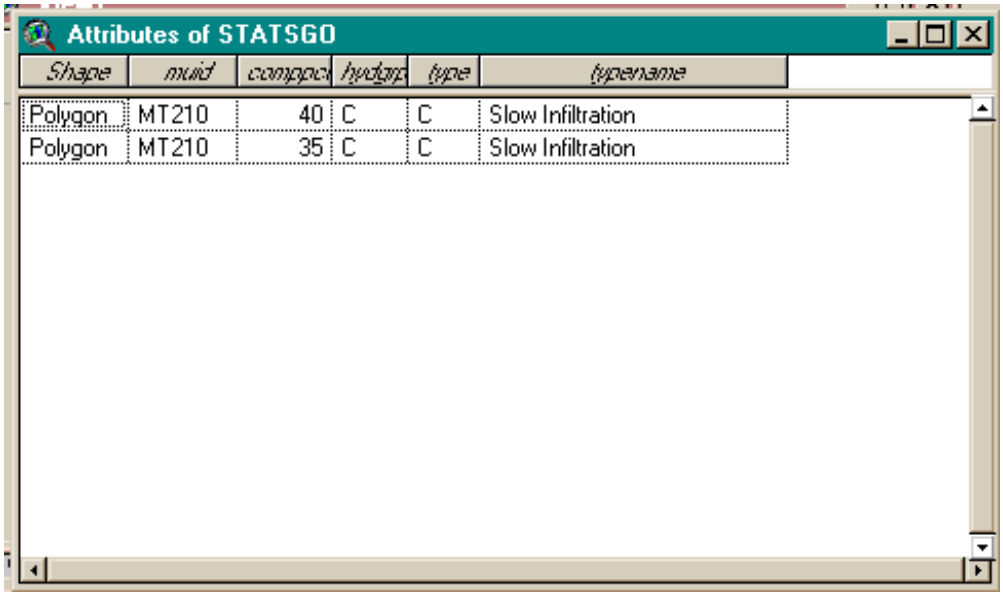


Table results from the above query 2.

7.2.2 Query 3. Slope – Display soils with steep slopes

Degree of slope is of considerable importance in range management because it affects both vegetation productivity and use by range animals. Slope is commonly expressed in percent. As slope increases, vegetation productivity declines per unit precipitation because less water enters the soil and more runs off as overland flow. Livestock use, particularly that of cattle, decreases with increasing slope because of the difficulty the animals have in climbing.

Slope gradient is the difference in elevation between two points and is expressed as a percentage of the distance between those points. For example, a difference in elevation of 1 meter over a horizontal distance of 100 meters is a slope of 1 percent.

Default: Soils with a slope greater than 25 percent.

Classes: Enter the high, low, and representative values to represent the range of slope gradient as a percentage for the map unit component. Entries are whole number integers and range from 0 to 999.

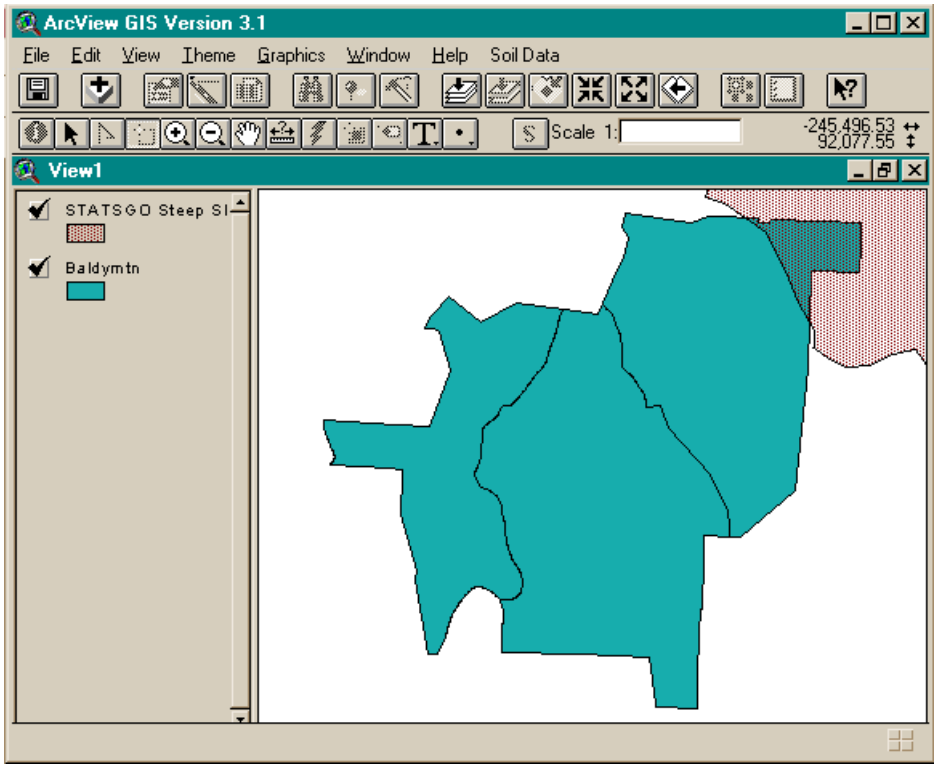
Significance: Rugged topography is the second most important cause of poor livestock distribution on rangelands. The reluctance of livestock to use steep slopes is not entirely undesirable since these areas are often fragile and valley bottoms can better withstand grazing. In many cases slopes serve as barriers to the use of benches and ridgetops above valley bottoms.

Livestock vary considerably in their willingness to use steep terrain. Large, heavy animals such as mature cattle or horses have difficulty in traversing steep rocky slopes. Cattle make little use of slopes over 10 percent. Because of their smaller size, greater agility, and surefootedness, sheep and goats use these areas more readily.

Slope gradient influences the retention and movement of water, the potential for soil slippage and accelerated erosion, for livestock to graze, soil-water states, and engineering uses of the soil.

Modify Query 3: Displays the Landform – Slope Classes Query Menu from the General Soils Queries Menu.

Example:



The results of running query 3 Slope.

Only a small area of the Baldy Mountain Allotment, according to STATSGO, contains steep slope.

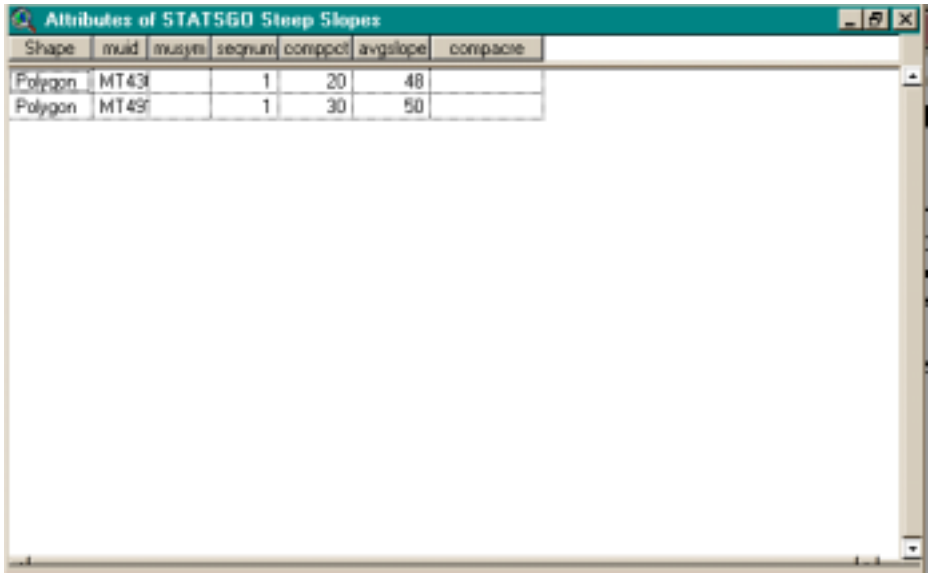


Table results from the above query 3.

7.2.3 Query 4. Create Ecological Site Map (STATSGO only)

An ecological site is a distinctive kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation. Rangeland landscapes are divided into ecological sites for the purposes of inventory, evaluation, and management.

The reason for STATSGO only, is because this field is not consistently entered in all of the SSURGO databases. It is entered in some SSURGO surveys but not all. A random check of SSURGO survey's, less than half had data entered for this field.

Default: None

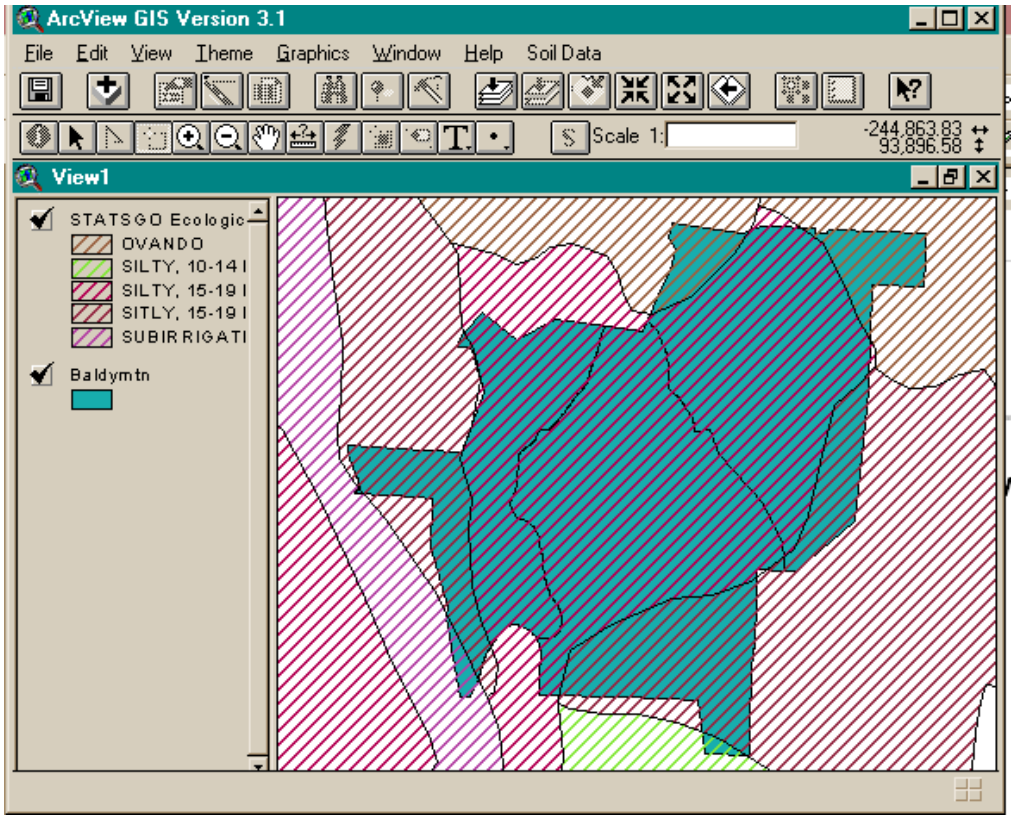
Classes: None

Significance: An ecological site is the product of all the environmental factors responsible for its development, and it has a set of key characteristics that are included in the ecological site description. Ecological sites have characteristic soils that have developed over time throughout the soil development process. The factors of soil development are parent material, climate, living organisms, topography or landscape position, and time. These factors lead to soil development or degradation through the processes of loss, addition, translocation, and transformation.

An ecological site has a characteristic hydrology, particularly infiltration and runoff, that has developed over time. The development of the hydrology is influenced by development of the soil and plant community. An ecological site has evolved a characteristic plant community (kind [cool season, warm season, grassland, shrub-grass, sedge meadow] and amount of vegetation). The development of the vegetation, the soil, and the hydrology are all interrelated. Each is influenced by the others and influences the development of the others. An association of species that differs from that of other ecological sites in the kind and/or proportion of species, or in total production typifies the plant community on an ecological site.

Modify Query 4: Not applicable

Example:



The results of running query 4 Create Ecological Site Map.

The ecological site map for the Baldy Mountain Allotment.

Attributes of STATSGO Ecological Sites

Shape	mukl	seqnum	layernum	kfact	compname	compbca	compacre	hydgrp	slopel	slopeh
Polygon	MT436	1	1	0.15	OVANDO	20	0	A	35	60
Polygon	MT436	1	2	0.05	OVANDO	20	0	A	35	60
Polygon	MT436	1	3	0.05	OVANDO	20	0	A	35	60
Polygon	MT436	1	4	0.02	OVANDO	20	0	A	35	60
Polygon	MT436	2	1	0.15	OVANDO	15	0	A	15	30
Polygon	MT436	2	2	0.05	OVANDO	15	0	A	15	30
Polygon	MT436	2	3	0.05	OVANDO	15	0	A	15	30
Polygon	MT436	2	4	0.02	OVANDO	15	0	A	15	30
Polygon	MT436	3	1	0.10	ELKNER	15	0	B	15	35
Polygon	MT436	3	2	0.10	ELKNER	15	0	B	15	35
Polygon	MT436	3	3	0.05	ELKNER	15	0	B	15	35
Polygon	MT436	3	4	0.02	ELKNER	15	0	B	15	35
Polygon	MT436	4	1	0.10	SHADOW	10	0	B	8	25
Polygon	MT436	4	2	0.05	SHADOW	10	0	B	8	25
Polygon	MT436	4	3	0.05	SHADOW	10	0	B	8	25
Polygon	MT436	4	4	0.05	SHADOW	10	0	B	8	25
Polygon	MT436	5	1	0.15	GARLET	10	0	B	8	25
Polygon	MT436	5	2	0.10	GARLET	10	0	B	8	25
Polygon	MT436	5	3	0.10	GARLET	10	0	B	8	25
Polygon	MT436	5	4	0.10	GARLET	10	0	B	8	25
Polygon	MT436	6	1	0.24	BRANHAM	5	0	C	15	60

The table results from the above query 4.

7.2.4 Query 5. Salinity – Display moderate to highly saline soils

Electrical conductivity is the electrolytic conductivity of an extract from saturated soil paste. It is a measure of the concentration of water-soluble salt in soils.

Default: >= 8 mmhos/cm occurring in the upper 20 inches of the soil profile.

Classes:

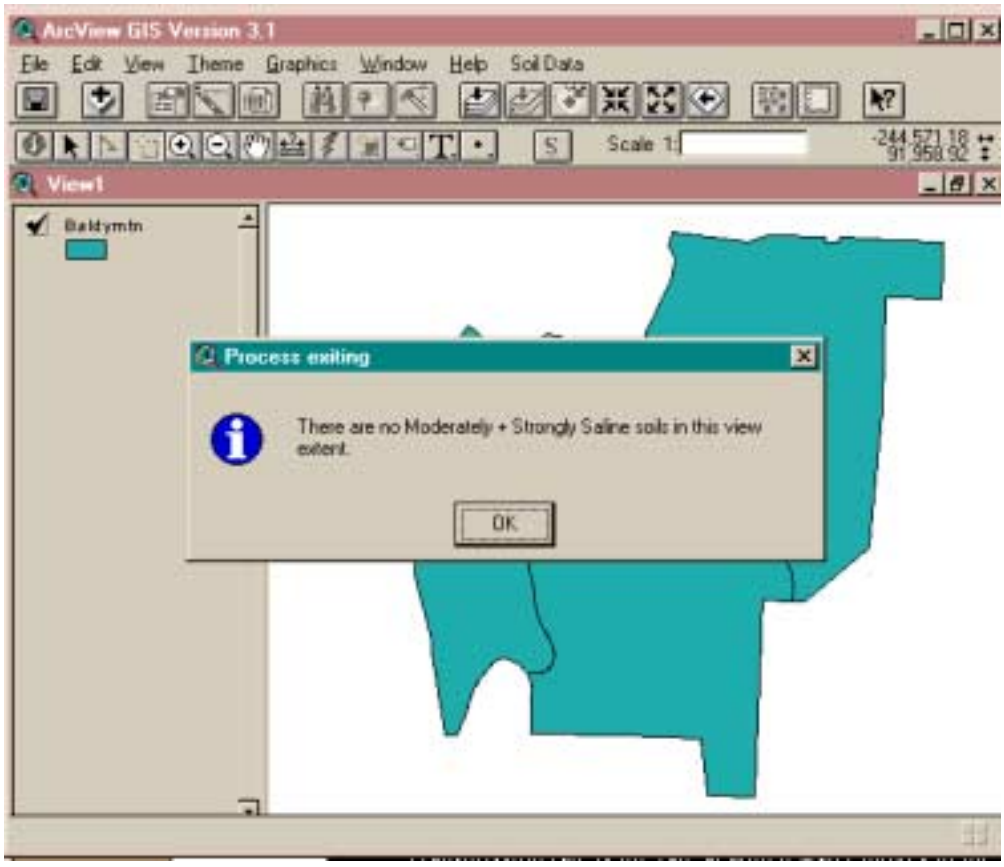
Classes	(ds m^{-1}) (mmhos cm^{-1})
Nonsaline	0 – 2
Very slightly saline	2 – 4
Slightly saline	4 – 8
Moderately saline	8 – 16
Strongly saline	> 16

Significance: Electrical conductivity is a measure of the concentration of water-soluble salts in soils. It is used to indicate saline soils. High concentrations of neutral salts, such as sodium chloride and sodium sulfate, may interfere with the absorption of water by plants because the osmotic pressure in the soil solution is nearly as high or higher than that in the plant cells. Salts may also interfere with the exchange capacity of nutrient ions, thereby resulting in nutritional deficiencies in plants.

These soluble salts, which are chlorides and sulfates of sodium, calcium, and magnesium, interfere with the absorption of water by plants. They create a higher osmotic pressure in the soil solution than in the plant cells. This can cause cell collapse and less water uptake. Salts also interfere with nutrient ion exchange between the soil and plant root, causing nutrient deficiencies in the susceptible plant. Ridding these soils of the excess salts makes them productive for culturally managed forages.

Modify Query 5: Displays the Salinity Query Menu from the General Soils Query Menu.

Example:



The results of running query 5 Salinity. This means that there are no moderate to highly saline soils on the Baldy Mountain allotment.

7.2.5 Query 6. Wind Erosion – Display soils with moderate to high susceptibility to wind erosion

A wind erodibility group (WEG) is a grouping of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to blowing. The Wind Erodibility Index (I), used in the wind erosion equation, is assigned using the wind erodibility groups.

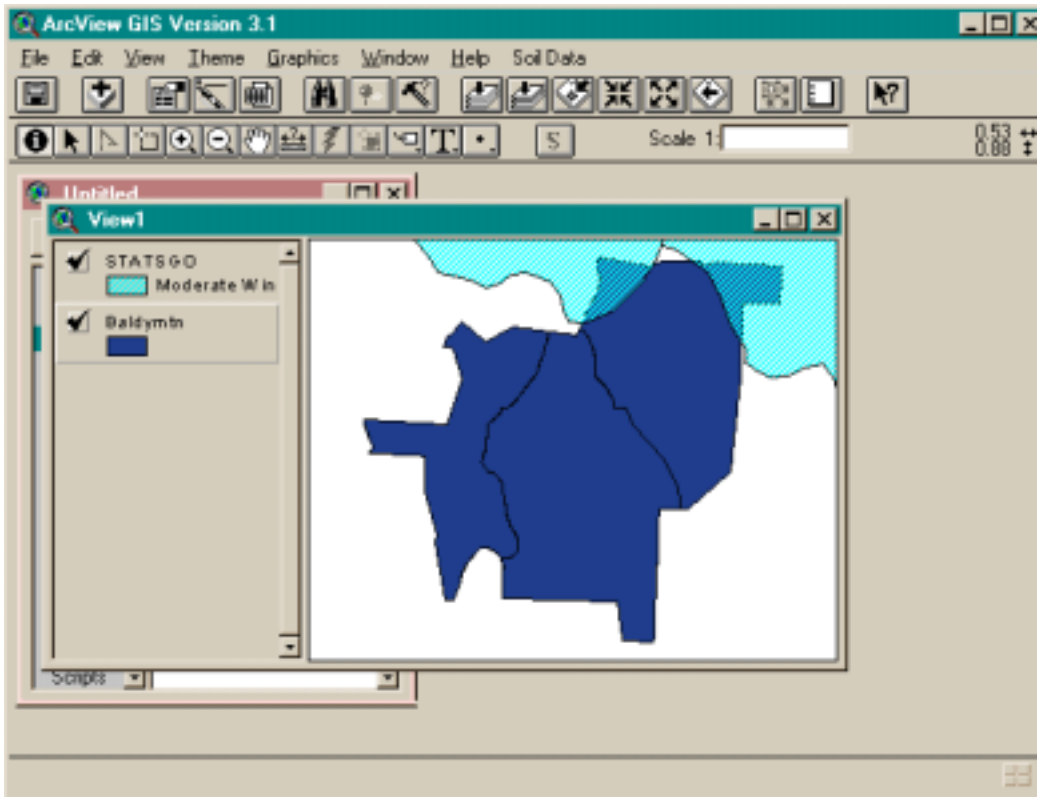
Default: WEG = 1, 2, 3, 4, 4L, and 5

Classes: Please see Appendix H for the WEG classes

Significance: There is a close correlation between soil blowing and the size and durability of surface clodiness, fragments, organic matter, and the calcareous reaction. The soil properties that are most important with respect to soil blowing are (1) soil texture, (2) organic matter content, (3) calcium carbonate reaction, (4) fragment content, and (5) aggregate stability. Soil moisture and the presence of frozen soil also influence soil blowing.

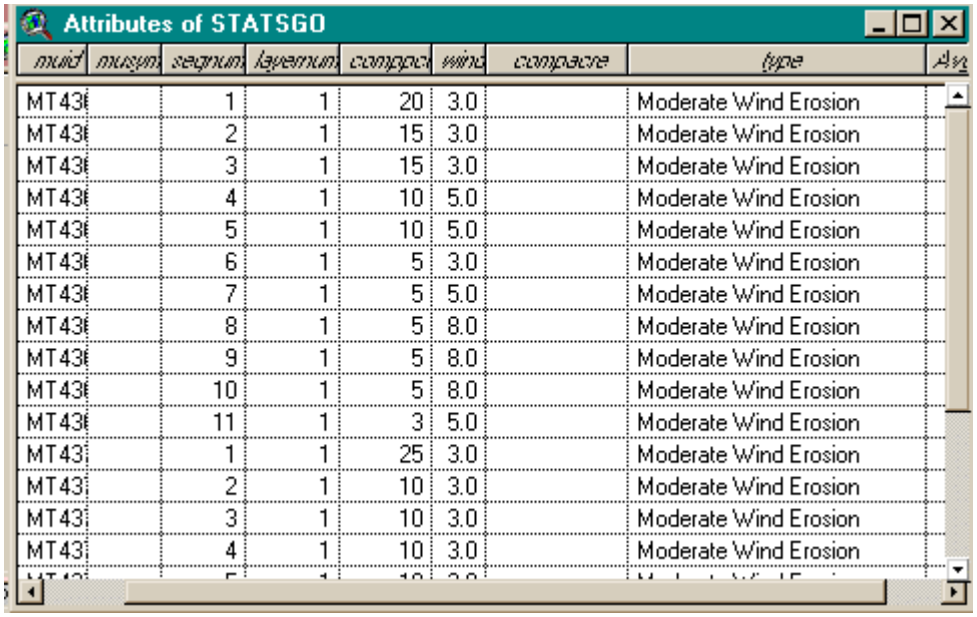
Modify Query 6: Displays the Wind Erosion Query Menu from the General Soils Query Menu.

Example:



The results of running query 6 Wind Erosion.

The area of the Baldy Mountain allotment that is susceptible to wind erosion.



muid	musym	seqnum	layernum	compact	wind	compcase	type	Als
MT43		1	1	20	3.0		Moderate Wind Erosion	
MT43		2	1	15	3.0		Moderate Wind Erosion	
MT43		3	1	15	3.0		Moderate Wind Erosion	
MT43		4	1	10	5.0		Moderate Wind Erosion	
MT43		5	1	10	5.0		Moderate Wind Erosion	
MT43		6	1	5	3.0		Moderate Wind Erosion	
MT43		7	1	5	5.0		Moderate Wind Erosion	
MT43		8	1	5	8.0		Moderate Wind Erosion	
MT43		9	1	5	8.0		Moderate Wind Erosion	
MT43		10	1	5	8.0		Moderate Wind Erosion	
MT43		11	1	3	5.0		Moderate Wind Erosion	
MT43		1	1	25	3.0		Moderate Wind Erosion	
MT43		2	1	10	3.0		Moderate Wind Erosion	
MT43		3	1	10	3.0		Moderate Wind Erosion	
MT43		4	1	10	3.0		Moderate Wind Erosion	

The table results from the *Wind Erosion* query.

7.2.6 Query 7. pH – Display strongly alkaline soils

Soil pH indicates the status of the oil in regard to exchangeable mineral ions. The pH value expresses whether a soil is basic or acidic. A high acid soil would have a pH of 4, while a highly basic soil would have a pH of 10. The scale ranges from 1 to 14. Minerals are most available to plants in soils with pH values between 6 and 8. A pH value of 7 is considered ideal for growth of most plants. However, many plant species grow best where soils are either highly acidic or basic.

Most soils in the western US are slightly basic because they are derived from calcareous parent material and receive low precipitation. The low rainfall results in little leaching of soil minerals and the associated base losses. Leaching refers to the downwashing of soil minerals from precipitation.

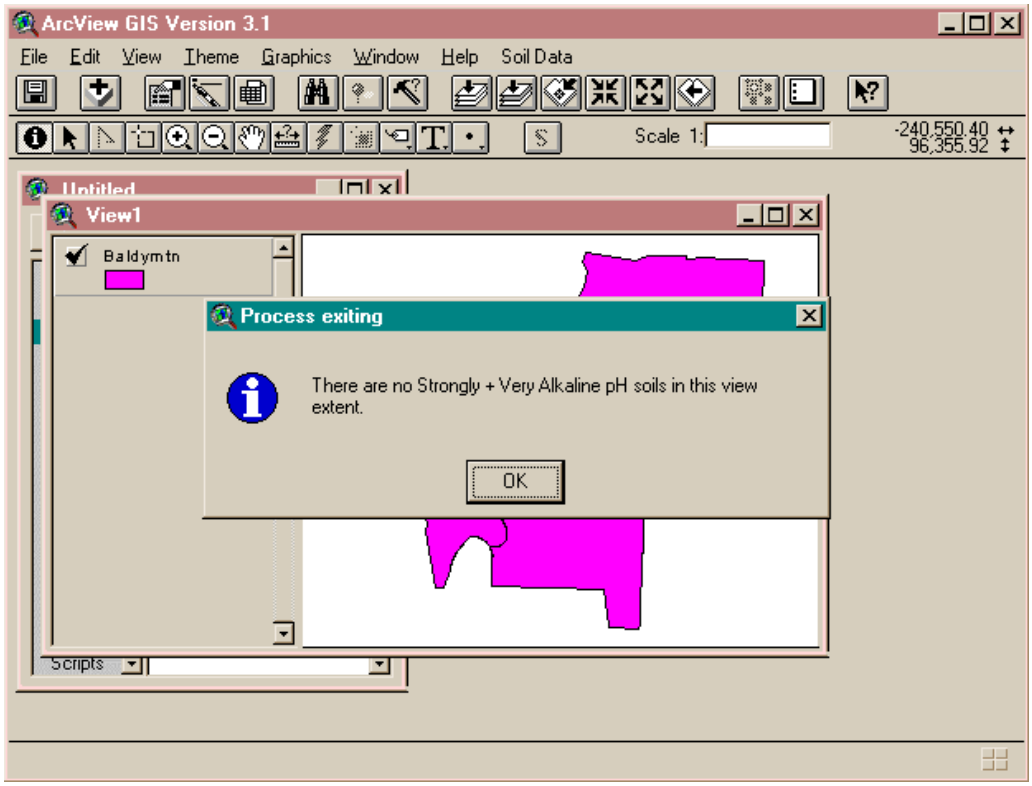
Default: pH greater than 8.4

Classes: The high, low, and representative values of the appropriate estimated pH range for each horizon. The high and low values are to correspond with the class limits as follows: 1.8-3.4, 3.5-4.4, 4.5-5.0, 5.1-5.5, 5.6-6.0, 6.1-6.5, 6.6-7.3, 7.4-7.8, 7.9-8.4, 8.5-9.0, 9.1-11.0; or enter a combination of classes, for example, 4.5-5.5. See the General Soil Queries for the pH classes.

Significance: A principal value of soil pH is the information it provides about associated soil characteristics. Two examples are phosphorus availability and base saturation. Soils that have a pH of approximately 6 or 7 generally have the most readily available of plant nutrients. Strongly acid or more acid soils have low extractable calcium and magnesium, a high solubility of aluminum, iron, and boron, and a low solubility of molybdenum. In addition, these soils have a possibility of organic toxins and generally have a low availability of nitrogen and phosphorus. At the other extreme are alkaline soils. Calcium, magnesium, and molybdenum are abundant with little or no toxic aluminum, and nitrogen will be readily available. If pH is above 7.9, the soils may have an inadequate availability of iron, manganese, copper, zinc, and especially of phosphorus and boron.

Soil reaction is one of several properties used as a general indicator of soil corrosively or its susceptibility to dispersion. In general, soils that are either highly alkaline or highly acid are likely to be corrosive to steel. Soils that have pH < 5.5 are likely to be corrosive to concrete. Soils that have pH > 8.5 are likely to be highly dispersible, and piping may be a problem.

Modify Query 7: Displays the pH Query Menu from the General Soil Query Menu.



The results of running query 7 pH.

There are no strongly alkaline soils on the Baldy Mountain allotment.

7.2.7 Query 8. Water Capacity – Display soils with low water capacity

Available water capacity (AWC) is the volume of water that should be available to plants if the soil, inclusive of fragments, were at field capacity. It is commonly estimated as the amount of water held between field capacity and wilting point, with corrections for salinity, fragments, and rooting depth.

Default: Weighted average AWC < 0.05

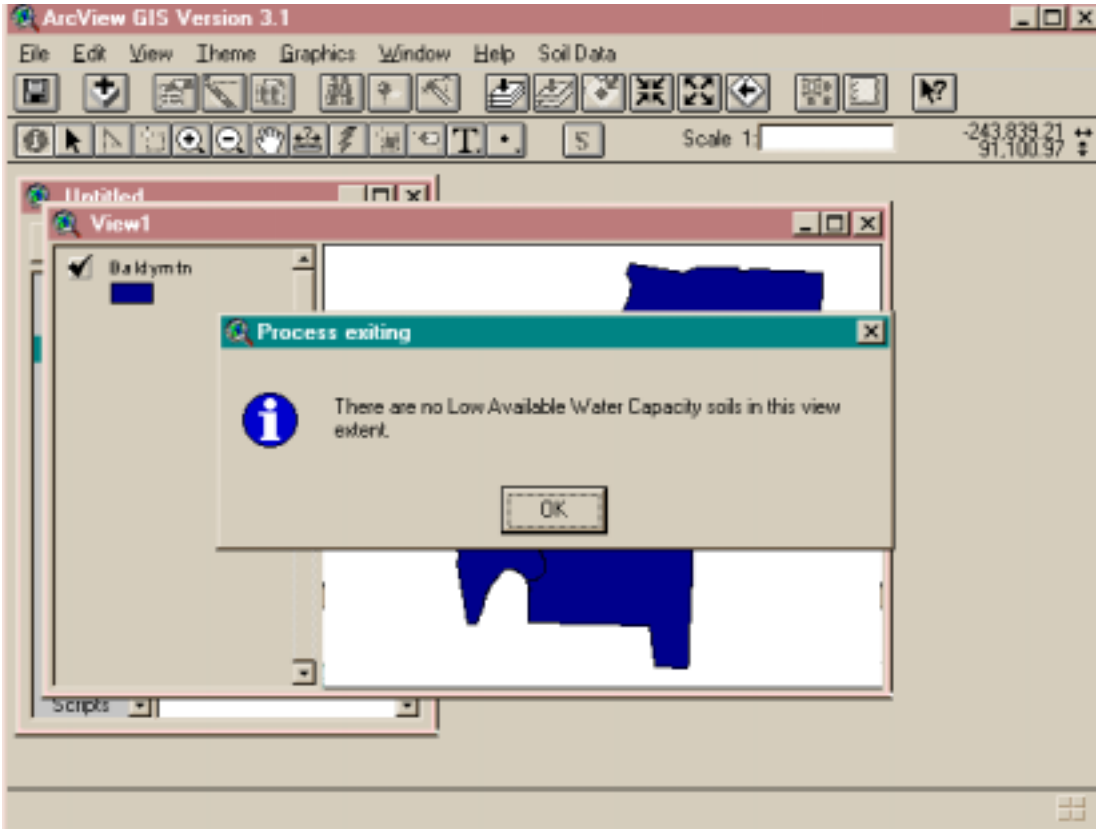
Classes: The range of value from 0.00 to 0.70 cm per cm.

Significance: Available water capacity is an important soil property in developing water budgets, predicting doughtiness, designing and operating irrigation systems, designing drainage systems, protecting water resources, and predicting yields.

From a soil texture standpoint, the silt fraction in a soil has the most influence on AWC: The higher the silt fraction, the higher the AWC. Nonporous rock fragments reduce AWC in proportion to the volume they occupy. On saline soils, AWC is reduced 25 percent for each 4 millimhos per centimeter of conductivity of the saturated extract. In Oxisols and Ultisols, where kaolinite and gibbsite clays are present in high amounts, AWC may be 20 percent lower than in soils having 2:1 lattice clays. Soils high in organic matter have higher AWC than soils that share similar mineralogy, texture, and rooting depth, but are low in organic matter.

Modify Query 8: Displays the Available Water Capacity Query Menu from the General Soil Query Menu.

Example:

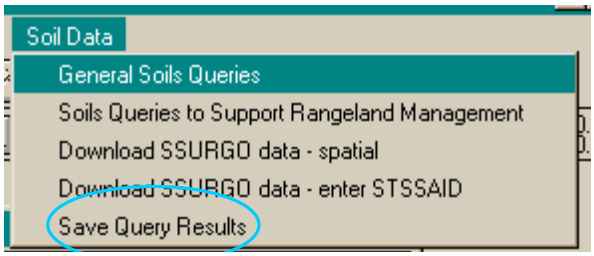


The results of running query 8 Water Capacity.

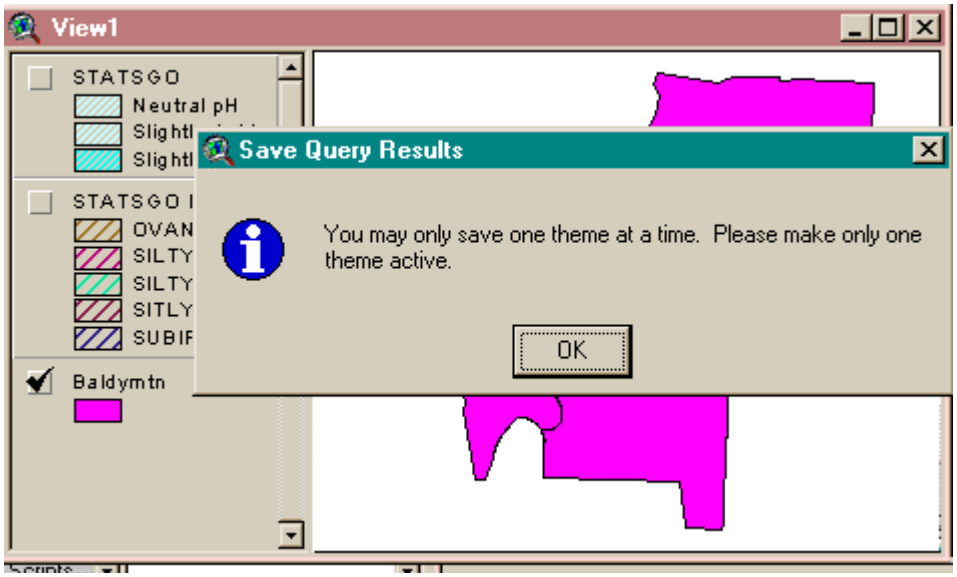
There are no soils with a low AWC for the Baldy Mountain allotment.

8.0 Save Results of Queries

Query results are stored in a temporary location. SSE cleans up most of the files in this temporary directory, therefore, your query results will be lost. If this clean-up did not occur, many large files would accumulate on your system. However, results of queries can be saved as a shape file, so you do not need to run the query each time you wish to use the results from a query.

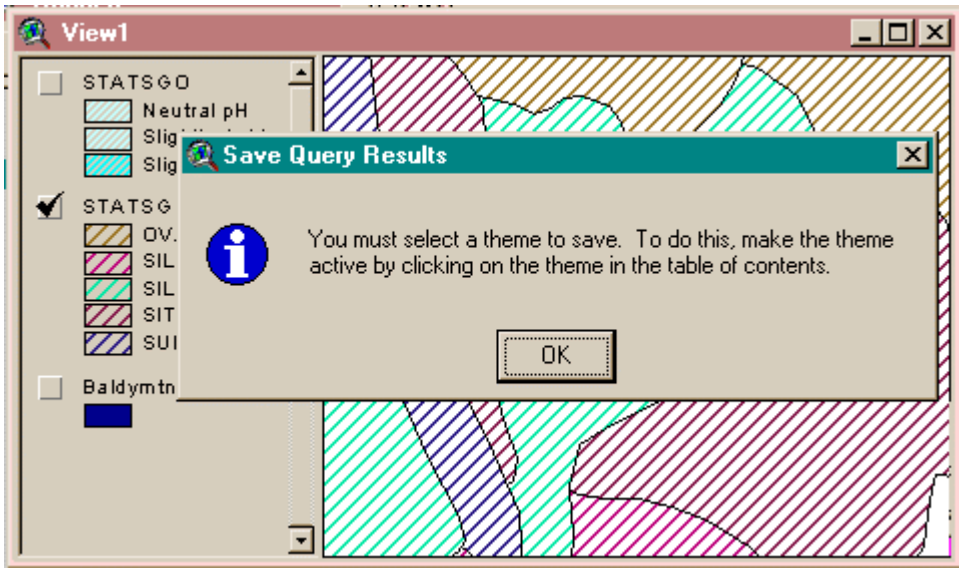


To save the results of queries, you must select a theme on the Table of Contents of the view you are working in, from the **Soil Data** menu choose the *Save Query Results*.



Make sure just one theme is active before you select *Save Query Results*. If you have more than one theme "selected" in the Table of Contents you will receive an error message.

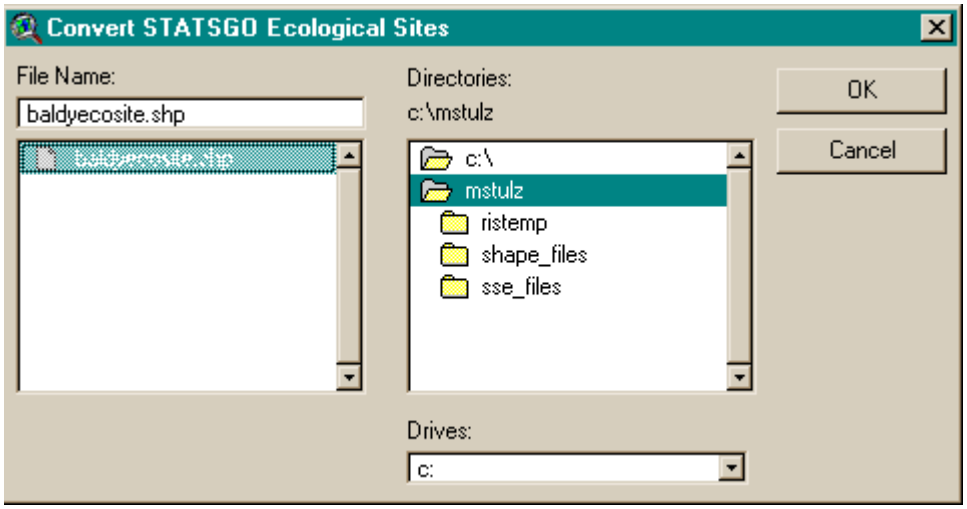
NOTE: Notice how the first two items listed in the Table of Contents are raised. This means they are "selected" or "active".



On the other hand, if you have no themes selected in the Table of Contents you also will receive an error message.

Only one theme can be saved at a time.

After you have one theme selected in the Table of Contents and select the Save Query Results Menu, you will be prompted for a name of the file and a location where the file should be saved.



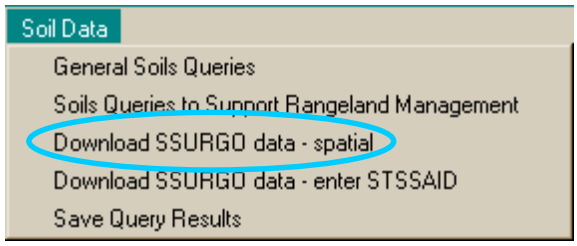
SSE will save the shape files with a default name and in a default location. It is up to the user to change the name and location of the shape files.

9.0 Download SSURGO Data

If you desire to use SSURGO data rather than STATSGO data, you will have to download the data for your desired area of interest (by County boundary). Some STATSGO data comes with the Extension, but the SSURGO data files are too large and are continually being produced by the NRCS. Therefore a utility to download the SSURGO data has been designed to assist you. There are two ways to download SSURGO data: Spatially or Alphanumerically.

9.1 Download SSURGO Data – Spatial

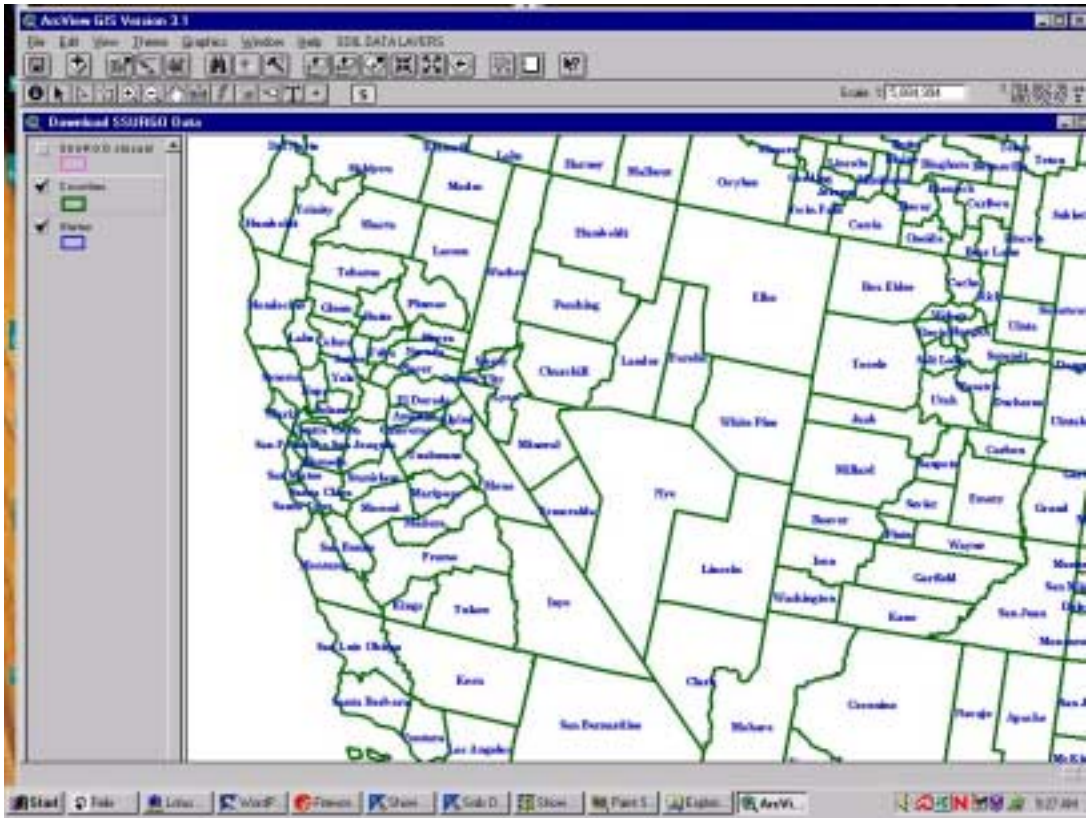
If you do not know the NRCS soil survey number (STSSAID) you can download surveys using maps. First starts out with a map of the US, you select a State, than select a county and finally the survey.



From the **Soil Data** menu on the View GUI, click the *Download SSURGO data - spatial* choice.

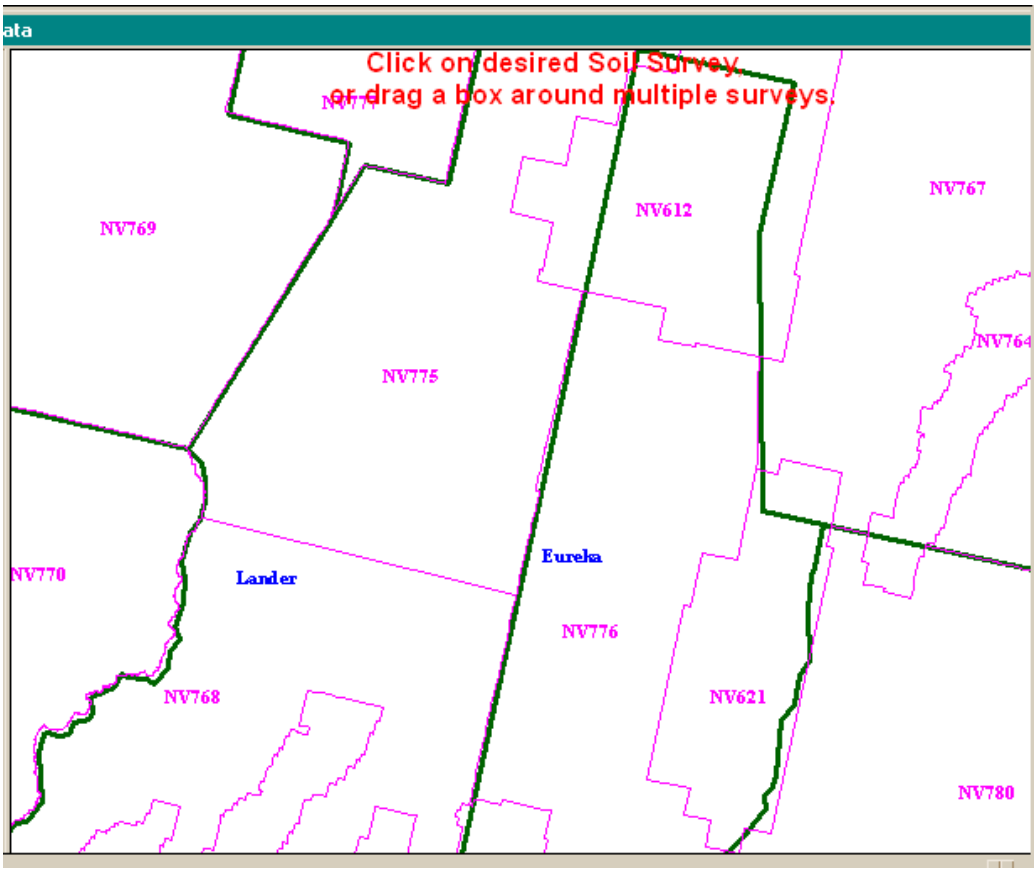
A map of the conter-minous United States will appear prompting you to select the state of interest.

As an example, click on Nevada.



The view will zoom to the Nevada state boundary and display counties in Nevada.

Next click on the County of your choice to view the SSURGO data sets. As an example, click on Eureka County.



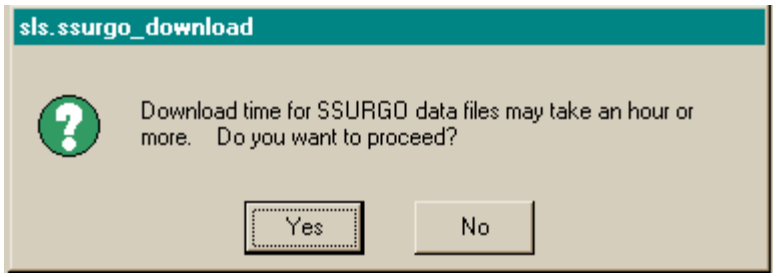
The pink lines are the SSURGO survey data sets. A small one to try is NV621 on the border of Eureka County and White Pine County.

To select just NV621, with the mouse click anywhere inside of the NV621 polygon.

If you desire to select more than one soil survey use the mouse to make a box that contains the surveys you wish download. The larger the area, the larger the file, the longer it will take to download from the NRCS web site.

Note: The NRCS web site is not always up and running. When it is not you most likely encounter problems while using this tool. Keep and eye on the MS DOS window that gets opened when downloading. Another problem some people have faced, is the NRCS ftp site going down in the middle of a download. This will cause lots of problems for SSE if this happens.

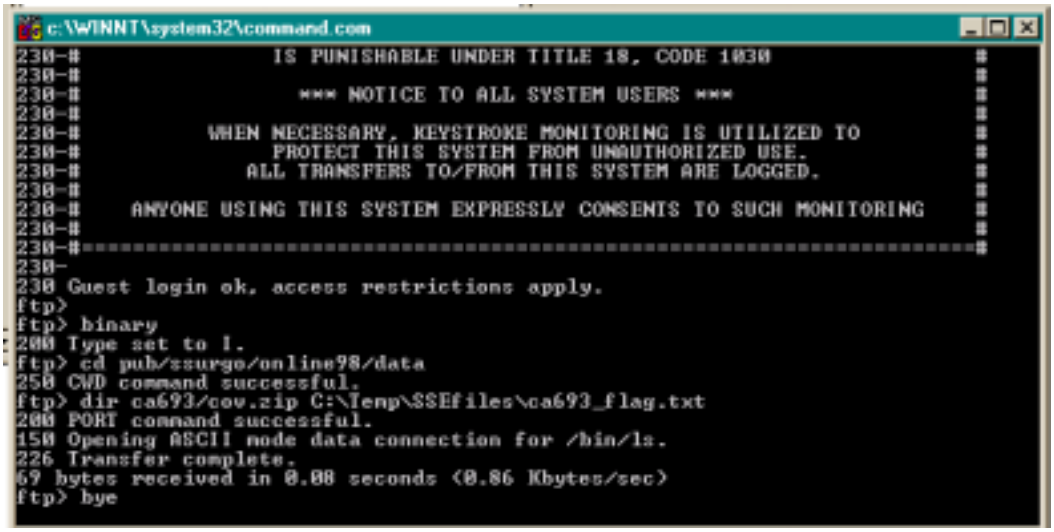
By clicking on the SSURGO survey data set(s) of interest, a batch job will be created to download the SSURGO data that may be available from NRCS ftp site. This new data will be placed in directories under your Soils/Surveys/Data/State_data directory. For the Nevada example above, the data would be put in the following location, soils/surveys/data/nv_state/cov/nv621/. With the use of a standard directory structure SSE knows where to look for SSURGO data when you are running queries from either the **General Soils Menu** or the **Rangeland Management Menu**.



A message box appears notifying you that files may take a long time to download.

Be aware that download time may range from just a few minutes to well over an hour for ***each*** survey, depending on its size, and on the equipment you are using. Once the data download is underway, you may continue to use ArcView.

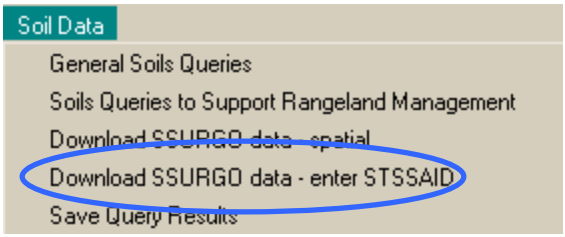
All surveys for the US are displayed in the previous map; however not all surveys are in a digital format. The extension contacts the ftp site to verify whether any SSURGO data exists for the selected soil survey(s). If none is found, a message box informs the user, and the STSSAID is removed from the list. ArcView will have a busy cursor during this process.



NOTE: There is currently no check for whether the ftp site is responding. If the site is down, the process will time out and display a message box saying that no data exists for this SSURGO survey. In this case, the message could be erroneous because the data verification process was interrupted. This information may be monitored in a system window like the one above which shows a successful query. If further verification of the ftp site status is desired, the URL is: ftp://ftp.ftw.nrcs.usda.gov/pub/ssurgo/online98/data.

9.2 Download SSURGO Data – Alphanumerically

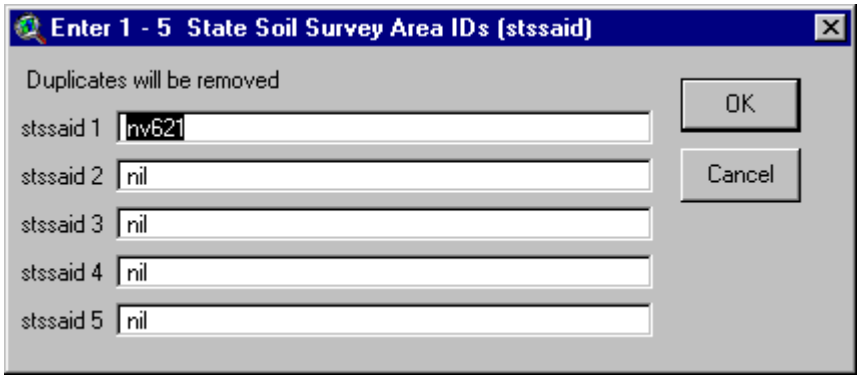
This option for downloading soil surveys is for when you know the State Soil Survey Area IDs (STSSAID). This way you skip the graphically interface for downloading.



From the **Soil Data** menu select the choice *Download SSURGO data – enter STSSAID*.

The *stssaid* is the SSURGO identifier for each soil survey. The *stssaid* is a concatenation of the FIPS alpha code for a state and the soil survey area symbol (*ssaid*). For example: NV777 or NV621.

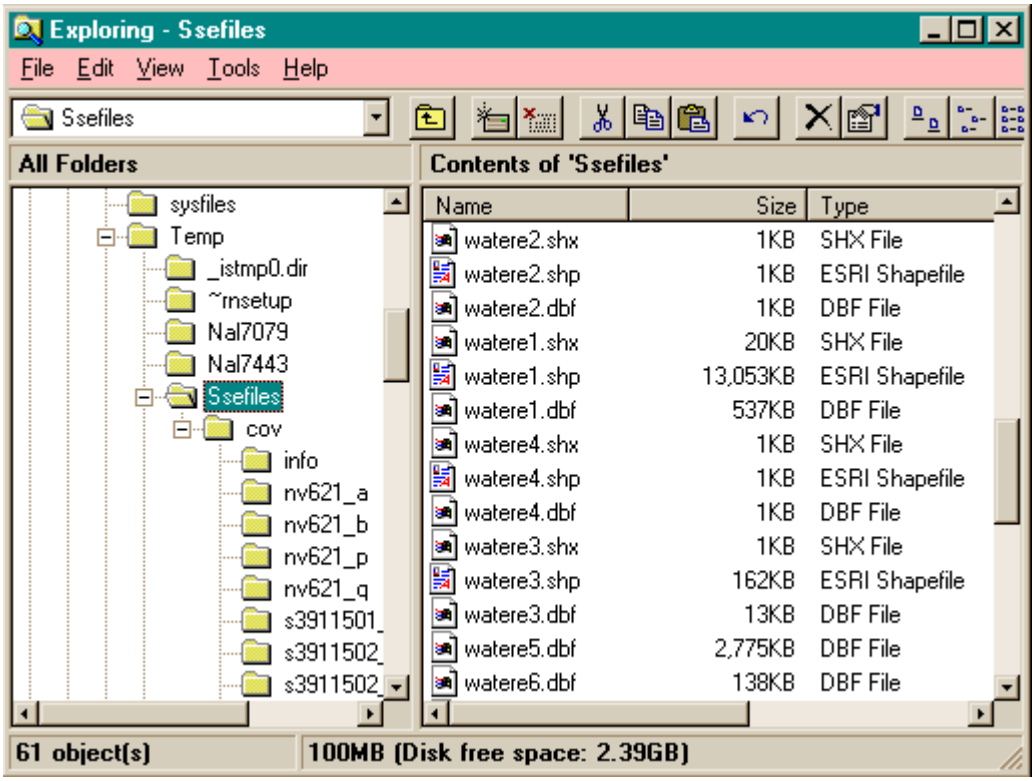
An entry form will appear asking you to enter 1 - 5 *stssaid*(s) that you would like to download. You must know the *stssaid* to follow this routine. This approach is intended for those who know the *stssaid* and do not want to click through spatial maps to determine the files they wish to download. If the *stssaid* is not available yet, the system will give you that information. Each file may take up to an hour or more to download.



10.0 Cleaning Up

Each query that is run creates a shapefile that is stored in your temporary directory. There is a potential of having numerous files in this temporary directory. To avoid these from happening unload the extension before you quit the ArcView session. See section 2.3 Unloading extension.

If you exit ArcView without unloading the extension, you have the option to manually delete the temporary files that are created. The location of the temporary directory was established the first time you ran SSE (Appendix B SSE Preference File). In most cases it is located, c:\temp\ssefiles. As you can see from the example below, there are 61 objects in the ssefiles directory, because the SSE extension was not unloaded before exiting ArcView.



If you have exited ArcView you can go in and delete these files using your operating system. Just select all the files you wish to delete and hit the  button. These files will go into your Recycle Bin (remember to empty the recycle bin also).

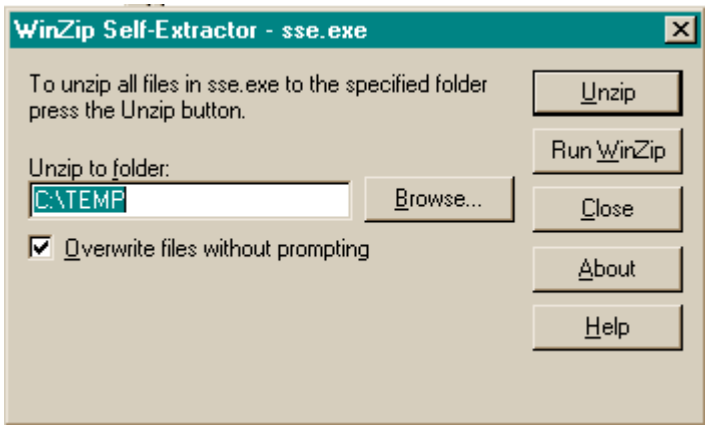
In the above example, notice that there is a directory called cov under the ssefiles directory. Under the cov directory there are many other directories. This is because the SSE download tool was used. When you download a SSURGO survey from the

NRCS site this is where the data is downloaded to. If everything goes fine the actual merged coverage and the metadata are copied over into the soils directory under the appropriate directory. You can also delete all of these files if you need the space. Once again select the directories or just the cov directory and hit the delete button.

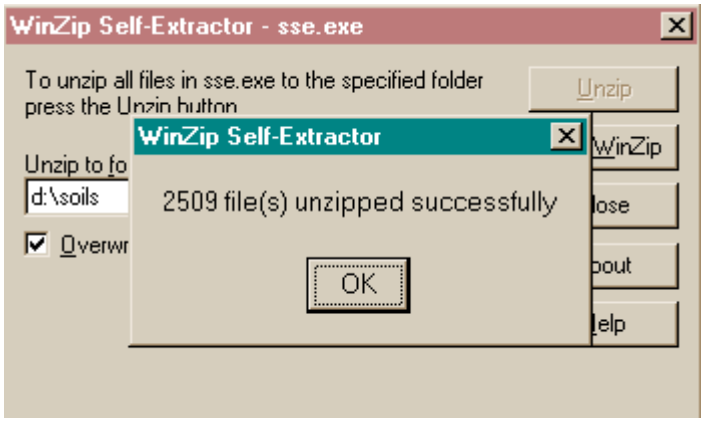
Appendix A – Installation

Unzip the Executable File

Unzip the SSE executable zip file (SSE.exe) by double clicking on it. This can be done from a CD-ROM or from a downloaded SSE.exe file from the BLM Intranet. A WindZip prompt will occur asking for the drive to unzip the file to (similar to the screen capture below).

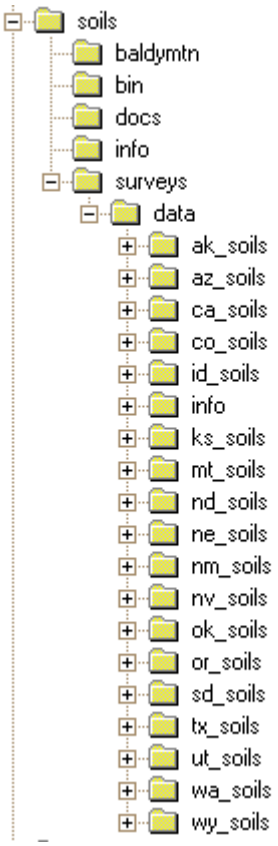


Notice the default *Unzip to folder: C:\TEMP* Is this where you want to unzip the soils to? Most likely this is not where you want to unzip the file. The File must be unzipped to a drive where you have write permissions (usually C or D drive). Click on the *Unzip* button and the file will start unzipping.



When the file is done unzipping you will see the message to the left. Click on *OK* and than click on *Close*.

The unzipped exe file will create a directory called **Soils** with sub-directories containing data. (See the screen capture below)



Copy the Extension File

Once the files have successfully unzipped to the directory you specified, you must copy the extension file "Soils\bin\SSE.avx" to the ESRI extension directory (C:\ESRI\Av_gis30\Arcview\xxt32) on your PC. This will enable ArcView to see the SSE extension file. ArcView has two variables that can be set so it knows where to look for extensions. For more information about these variables please see the BLM's FAQ's for ArcView Intranet web page, http://web.blm.gov/narsc/gis/faq/AVVariables.html.

Netscape Variable

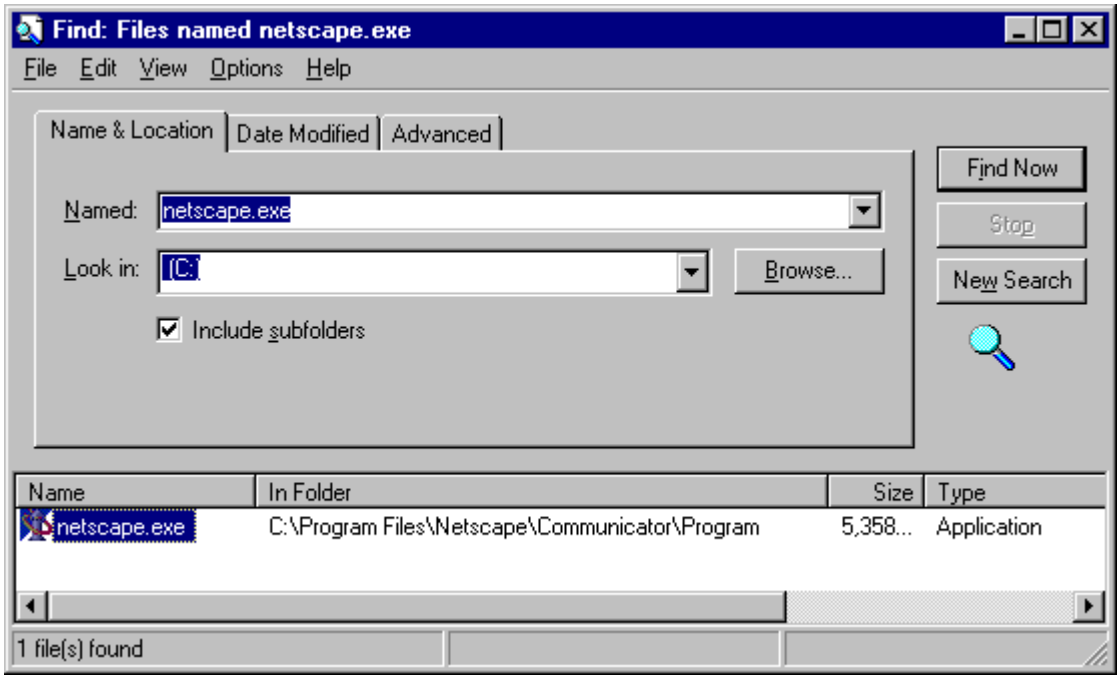
One system variable must be set on the NT workstation in order for the help function on the application to connect to Netscape and open the on-line documentation.

Note: This will only work (and is therefore only necessary) if you are connected to a BLM network.

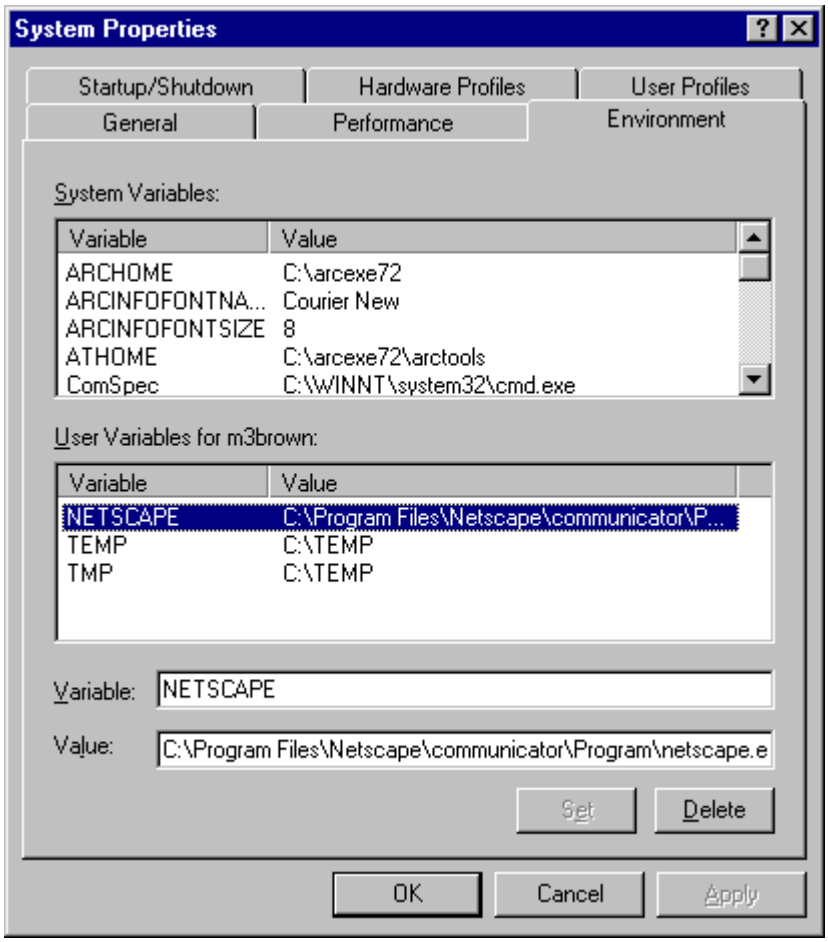
To set the "Netscape" variable to the path of the netscape.exe file you must:

1) Know the path to the file: Open the Windows NT explorer and click on the "Tools" menu and then use the "Find files or folders" function. On the C:\ Drive, search for "netscape.exe". The find files function will return the path to the netscape.exe file (usually located under the "Program Files" directory). See below as an example.

Note: The window below is resizable and the column "In Folder" may be increased to see the full path to the netscape.exe file.



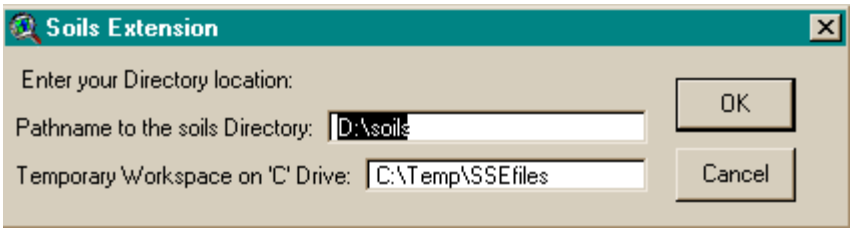
2) Now that the path is known, you can set the system variable. Click on the **Start** button, then click on **Settings**, then click on **Control Panel**. The control panel will open. Click on the **System** icon and then on the **Environment** Tab. In the bottom of the dialog, in the variable text line, type: "Netscape". In the Value text line type the path obtained from the Windows NT Explorer in the step above. (see below as an example).



The Netscape variable is now set, and the help menu function will know where the application is when you prompt for SSE help.

Appendix B – SSE Preference File

This extension uses a preference file that tells the extension where the soil data is located and a place where you wish to write temporary files. The first time this extension is used you will be prompted via a dialog box, to enter the data required for the preference file.



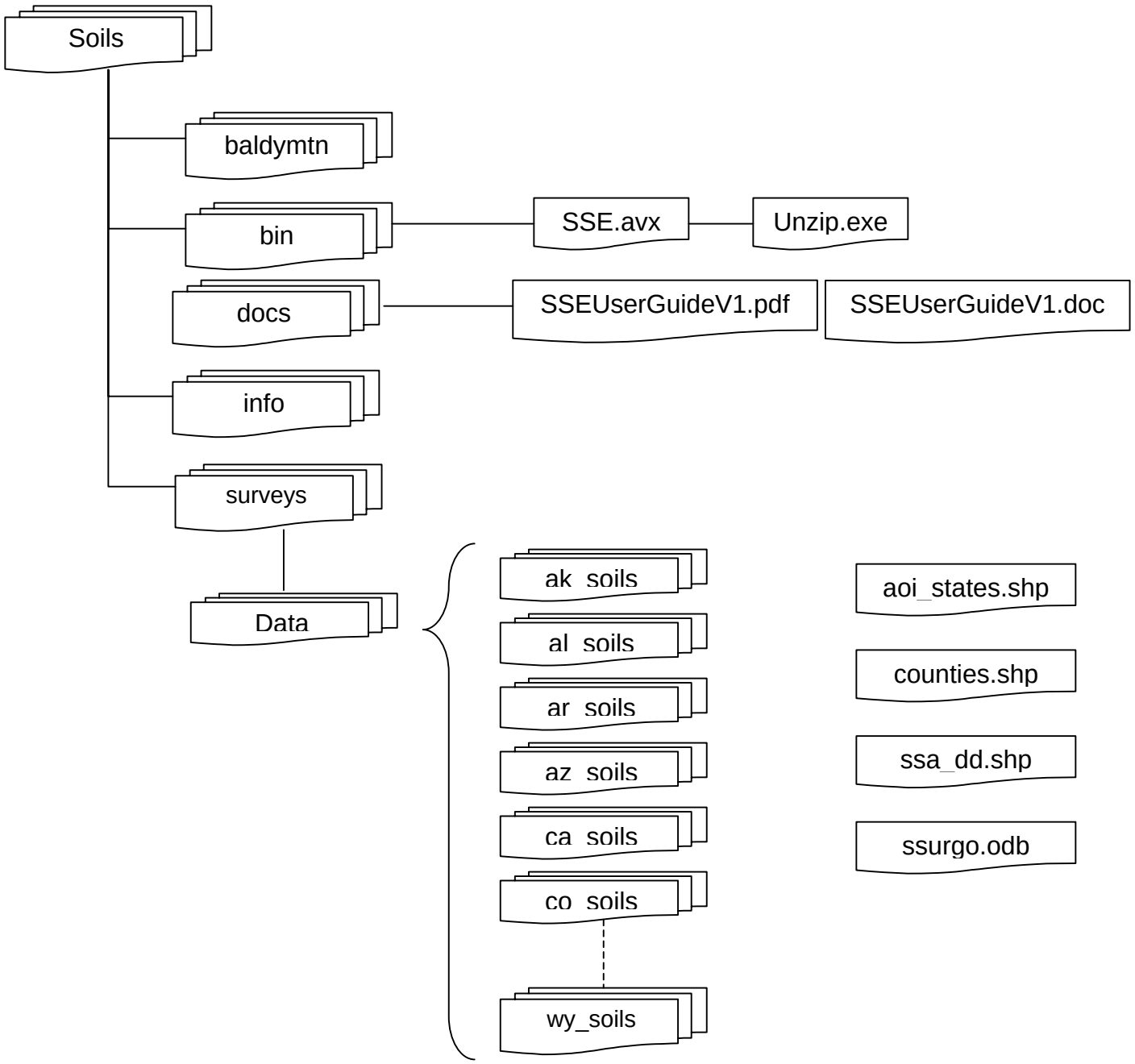
Line 1: Pathname to the soils Directory. This is the location of the soils directory that was unzipped. You may chose to unzip the SSE under any directory, therefor, this line in the preference file lets the extension know where you unzipped the file.

Line 2: Temporary Workspace on 'C' Drive: This line is for the temporary work space where intermediate files will be written while the application is running. If the temporary directory does not exist, the program will create one for you.

Click on *OK* when you are finished entering the path names. This message box will only appear the FIRST time you run the extension. By clicking on "OK" you are writing a text file to the $HOME directory that the extension will look for on future sessions. If the file is present, it will read the location of the Soils directory and the location of the Temporary directory from this file. The file is named "sls_variables.txt".

Note: This file may be altered or deleted if you decided to change the location of either your data or your temporary work space. If the file is deleted, you will be prompted with the above message box the next time you run a soils query.

Appendix C - SSE Directory Structure

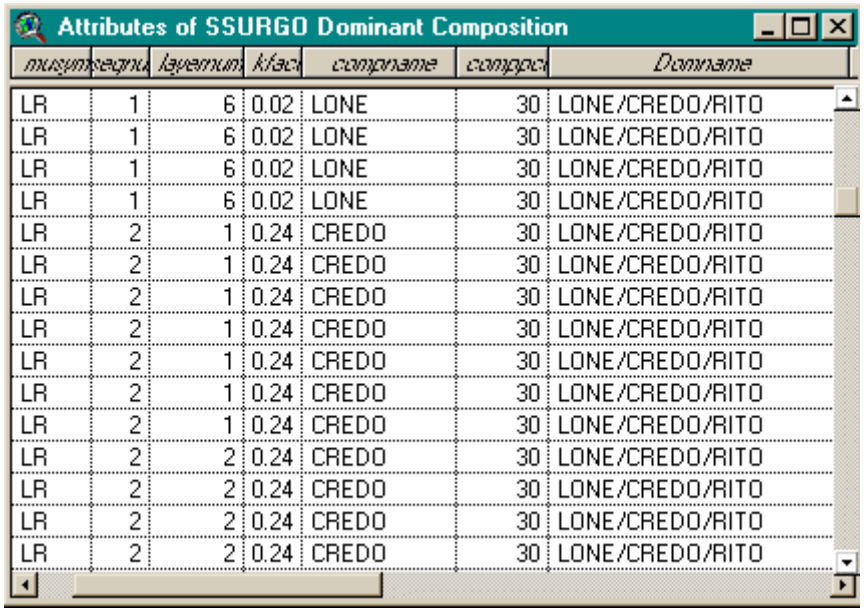


General Soils Queries

1. Erodibility
   A. Wind Erosion
      The weg group is assigned a numeric value equal to it's group (4L = 4.5), this is stored in column *wind*, for [layernum = 1]. For each mapping unit the average wind erosion is calculated as, Σ([*comppct*] * *wind*)/total *comppct*. The value is put in the field, *AvgWind*. Then the *AvgWind* field is assigned a legend class symbol, field *type*, according to slope classes as defined in the General Soils Queries, Wind Erosion Query Menu.

   B. Water Erosion
      (([KFact] >= 0.32) and ([avgslope] > 10) and ([layernum] = 1))

2. Composition
   Finds the dominant component percent. A color in the map legend is assigned to every component name. If there is no clear dominant component, i.e., all are equal percent, than all component names will be displayed. For example, SSURGO survey, NV621, map symbol LR is composed of Lone 30%, Credo 30%, and Rito 30%, the dominant component name will be LONE/CREDO/RITO. If there is a clear dominant, as shown in the example in the text, the dominant will be displayed in the *Domname* field, but all the components are still listed in the *compname* field.



musym	seqnum	layernum	kfact	compname	comppct	Domname
LR	1	6	0.02	LONE	30	LONE/CREDO/RITO
LR	1	6	0.02	LONE	30	LONE/CREDO/RITO
LR	1	6	0.02	LONE	30	LONE/CREDO/RITO
LR	1	6	0.02	LONE	30	LONE/CREDO/RITO
LR	2	1	0.24	CREDO	30	LONE/CREDO/RITO
LR	2	1	0.24	CREDO	30	LONE/CREDO/RITO
LR	2	1	0.24	CREDO	30	LONE/CREDO/RITO
LR	2	1	0.24	CREDO	30	LONE/CREDO/RITO
LR	2	1	0.24	CREDO	30	LONE/CREDO/RITO
LR	2	1	0.24	CREDO	30	LONE/CREDO/RITO
LR	2	1	0.24	CREDO	30	LONE/CREDO/RITO
LR	2	2	0.24	CREDO	30	LONE/CREDO/RITO
LR	2	2	0.24	CREDO	30	LONE/CREDO/RITO
LR	2	2	0.24	CREDO	30	LONE/CREDO/RITO
LR	2	2	0.24	CREDO	30	LONE/CREDO/RITO

3. Slope

   The ([slopeh] + [slopel])/2.0 > 0) is calculated and stored in a field called, *avgslope*. For each mapping unit the average available water capacity is calculated as, Σ([*comppct*] * *avgslope*)/total *comppct*. The value is put in the field, *CompAvg*. Then the *CompAvg* field is assigned a legend class symbol, field *type*, according to slope classes as defined in the General Soils Queries, Landform – Slope Classes Query Menu.

4. Soil Water Characteristics

   A. Infiltration (Hydrologic Group)

   The dominant *compct* for each mapping unit is calculated and is populated in field *type*. Then the *typename* field is assigned a legend class symbol, according to water infiltration (Hydrologic Group) classes defined in the General Soils Queries, Soil Water Characteristics Queries, Water Infiltration/Transmission Rate Menu.

Attributes of STATSGO

Shape	mukf	compct	hydgrp	type	typename
Polygon	MT210	40	C	C	Slow Infiltration
Polygon	MT210	35	C	C	Slow Infiltration
Polygon	MT237	35	C	C	Slow Infiltration
Polygon	MT238	25	B	B	Moderate Infiltration
Polygon	MT238	25	B	B	Moderate Infiltration
Polygon	MT389	25	B	B	Moderate Infiltration
Polygon	MT436	20	A	A	High Infiltration

   B. Available Water Capacity

   The ([awch] + [awcl])/2.0 < 2) and ([laydepl] <= 20.0), is calculated and stored in field *avgawc*. For each mapping unit the average available water capacity is calculated as, Σ([*comppct*] * avgawc)/total *comppct*. The value is put in the field, *CompAvgawc*. Then the *CompAvgawc* field is assigned a legend class symbol, field *type*, according to available water classes as defined in the General Soils Queries, Available Water Capacity Query Menu, section.

Appendix D - Queries Defined

Rangeland Management Soils Queries

1. Water Erosion
   (([KFact] >= 0.32) and ([avgslope] > 10) and ([layernum] = 1))

2. Water Infiltration
   (([hydgrp] = ""C"") or ([hydgrp] = ""D"")) for the dominant percent

3. Slope
   (([slopeh] + [slopel])/2.0 >= 25) for the dominant percent

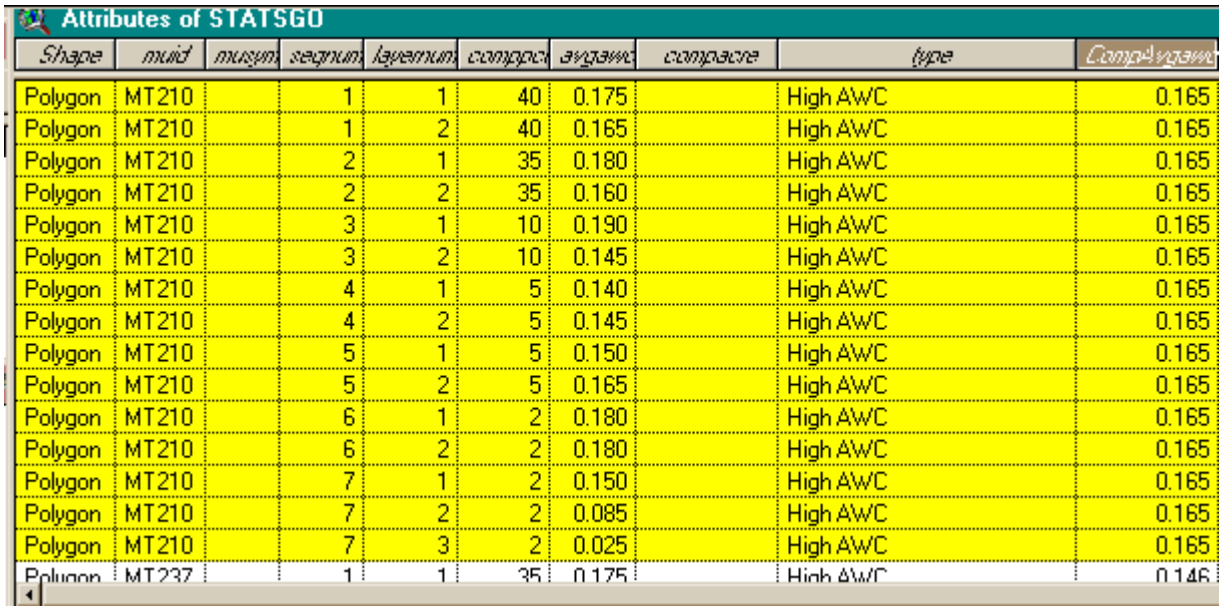
4. Ecological Sites
   - First goes through and find the dominant percent of the mapping unit
   - Calculates which ecological site is the highest percent for the mapping unit and displays the information under a column DomRSname

5. Salinity
   (([salinh] + [salinl])/2.0 >= 8.0) and ([laydepl] <= 20.0)

6. Wind Erosion
   selected mapunits having WEG = 1,2,3,4,4L in the surface (layer 1)

7. pH
   (([pHh] + [pHl])/2.0 >= 8.0) and ([laydepl] <= 20.0)

8. Water Capacity
   (([awch] + [awcl])/2.0 >= 8.0) and ([laydepl] <= 20.0)



Attributes of STATSGO

Shape	muid	musym	seqnum	layernum	comppct	avgawc	compkind	type	CompAvgawc
Polygon	MT210		1	1	40	0.175		High AWC	0.165
Polygon	MT210		1	2	40	0.165		High AWC	0.165
Polygon	MT210		2	1	35	0.180		High AWC	0.165
Polygon	MT210		2	2	35	0.160		High AWC	0.165
Polygon	MT210		3	1	10	0.190		High AWC	0.165
Polygon	MT210		3	2	10	0.145		High AWC	0.165
Polygon	MT210		4	1	5	0.140		High AWC	0.165
Polygon	MT210		4	2	5	0.145		High AWC	0.165
Polygon	MT210		5	1	5	0.150		High AWC	0.165
Polygon	MT210		5	2	5	0.165		High AWC	0.165
Polygon	MT210		6	1	2	0.180		High AWC	0.165
Polygon	MT210		6	2	2	0.180		High AWC	0.165
Polygon	MT210		7	1	2	0.150		High AWC	0.165
Polygon	MT210		7	2	2	0.085		High AWC	0.165
Polygon	MT210		7	3	2	0.025		High AWC	0.165
Polygon	MT237		1	1	35	0.175		High AWC	0.146

5. Stability
   ([permh] + [perml] / 2 < 0.2) and ([omh] + [oml] / 2 < 1.0) and ([salinh] + [salinl] /2 > 8.0) and ([pHh] + [pHl] /2 > 8.4) and [layernum] = 1. The legend just shows *stability*.

6. Chemistry
   A. pH
      The [pHh] + [pHl]/2 for laydep = 20 inches, this is stored is field *avgpH*. For each mapping unit the average pH is calculated as, Σ([*comppct*] * avgpH)/total *comppct*. The value is put in the field, *CompAvgph*. Then the *CompAvgph* field is assigned a legend class symbol, field *type*, based on the pH classes as defined in the General Soils Queries section, Chemistry Queries, pH section.

Attributes of STATSGO

Shape	mukf	musym	seqnum	layernum	comppct	avgph	compacc	type	CompAvgpH
Polygon	MT210		1	1	40	7.200		Slightly Alkaline pH	7.34
Polygon	MT210		1	2	40	7.500		Slightly Alkaline pH	7.34
Polygon	MT210		2	1	35	6.950		Slightly Alkaline pH	7.34
Polygon	MT210		2	2	35	7.600		Slightly Alkaline pH	7.34
Polygon	MT210		3	1	10	7.200		Slightly Alkaline pH	7.34
Polygon	MT210		3	2	10	7.200		Slightly Alkaline pH	7.34
Polygon	MT210		4	1	5	7.200		Slightly Alkaline pH	7.34
Polygon	MT210		4	2	5	7.900		Slightly Alkaline pH	7.34
Polygon	MT210		5	1	5	7.900		Slightly Alkaline pH	7.34
Polygon	MT210		5	2	5	8.200		Slightly Alkaline pH	7.34
Polygon	MT210		6	1	2	6.700		Slightly Alkaline pH	7.34
Polygon	MT210		6	2	2	6.950		Slightly Alkaline pH	7.34
Polygon	MT210		7	1	2	6.950		Slightly Alkaline pH	7.34
Polygon	MT210		7	2	2	7.200		Slightly Alkaline pH	7.34
Polygon	MT210		7	3	2	7.200		Slightly Alkaline pH	7.34
Polygon	MT237		1	1	35	6.700		Slightly Alkaline pH	7.64
Polygon	MT237		1	2	35	6.950		Slightly Alkaline pH	7.64

B. Salinity

The field *avgsal* is calculated; [salinh] + [salinl])/2.0 < 999) and ([laydepl] <= 20.0). Than Component percent (*comppct*) is multiplied by the *avgsal*. All the avgsal for each mapping unit is added together and than divided by the number of entries. This number is populated in field *CompAvgSal.* The *CompAvgSal* field is assigned a legend class symbol, field *type* based on the salinity classes as defined in the General Soils Queries section, Chemistry Queries, Salinity section.

Attributes of STATSGO

Shape	mukf	musym	seqnum	layernum	comppct	avgsal	compacsa	type	CompAvgSal
Polygon	MT210		3	1	10	0		Non-Saline	0.59
Polygon	MT210		3	2	10	0		Non-Saline	0.59
Polygon	MT210		5	1	5	2		Non-Saline	0.59
Polygon	MT210		5	2	5	2		Non-Saline	0.59
Polygon	MT210		6	1	2	0		Non-Saline	0.59
Polygon	MT210		6	2	2	0		Non-Saline	0.59
Polygon	MT237		1	3	35	2		Very Slightly Saline	2.80
Polygon	MT237		2	1	25	1		Very Slightly Saline	2.80

Appendix E - Understanding NRCS Soil Data

NRCS has established three geographic databases representing soil maps and related variables compiled at different scales. Table 1 summarizes the primary uses, scales, and sources for each of the three databases. Each map unit is linked to attribute data files containing soil properties and interpretive information. The NRCS Soil Interpretations Record database is the attribute data for each database.

SOIL DATABASE	PRIMARY USE	SCALE	SOURCE
SSURGO – Soil Survey Geographic	Farm, landowner, and county natural resource planning and management.	1:12,000 to 1:63,360	Field methods.
STATSGO- State Soil Geographic	Regional, State, river basin, and multi-county resource planning, monitoring and management.	1:250,000	Generalized from more detailed soil survey maps, transects, LANDSAT images.
NATSGO- National Soil Geographic	National and regional appraisal, planning, and monitoring.	1:5,000,000	1982 National Resources Inventory

Table 1. NRSC Soil Geographic Databases

STATSGO was compiled for each state and designed primarily for regional, multi-state, river basin, state and multi-county resource planning, management, and monitoring. STATSGO data are not sufficiently detailed to make interpretations at the county level. In most areas, STATSGO maps were compiled by generalizing more detailed SSURGO maps. Where more detailed soil survey maps were not available, data on geology, topography, vegetation, and climate were assembled, together with Land Remote Sensing Satellite (LANDSAT) images. Soils of like areas were studied, and probable classification and extent of soils was determined. STATSGO map units are combinations of areas on the more detailed soils maps.

For STATSGO and SSURGO, each map unit can have multiple components and each component can have multiple layers (figures 1 & 2). Attributes of map units are statistical summaries of attributes from all the component soils used to characterize an entire map unit. Consequently, each map unit can have multiple components, SSURGO maximum of 3, STATSGO maximum of 21, and each component can have multiple layers (maximum of six). The soils component attribute table maintains 60 variables for each soil component. The layer table maintains 28 variables for each soil component layer. In addition to the soil tables (component and layer) there are interpretive data also.

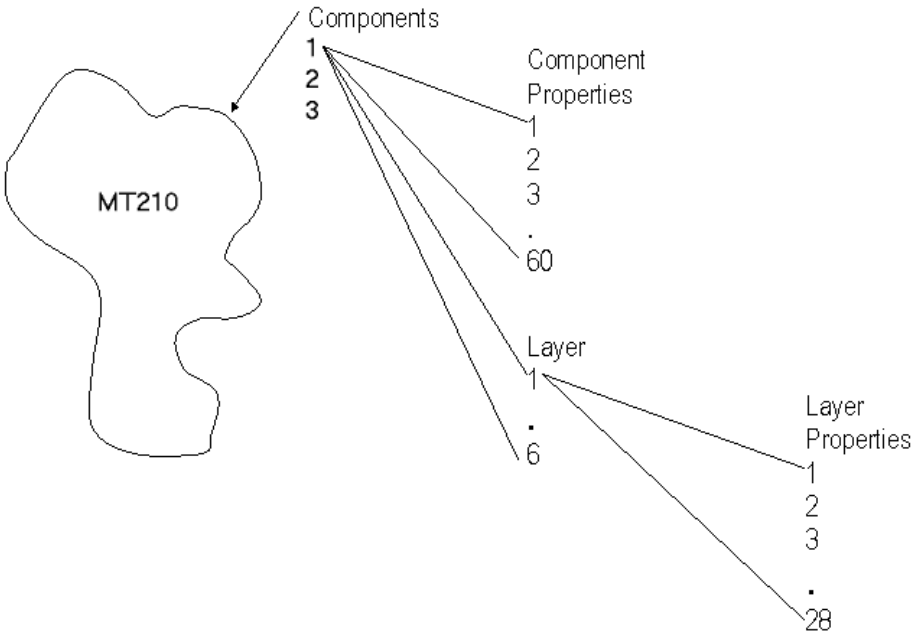


Figure 1 SSURGO Soil Map Unit

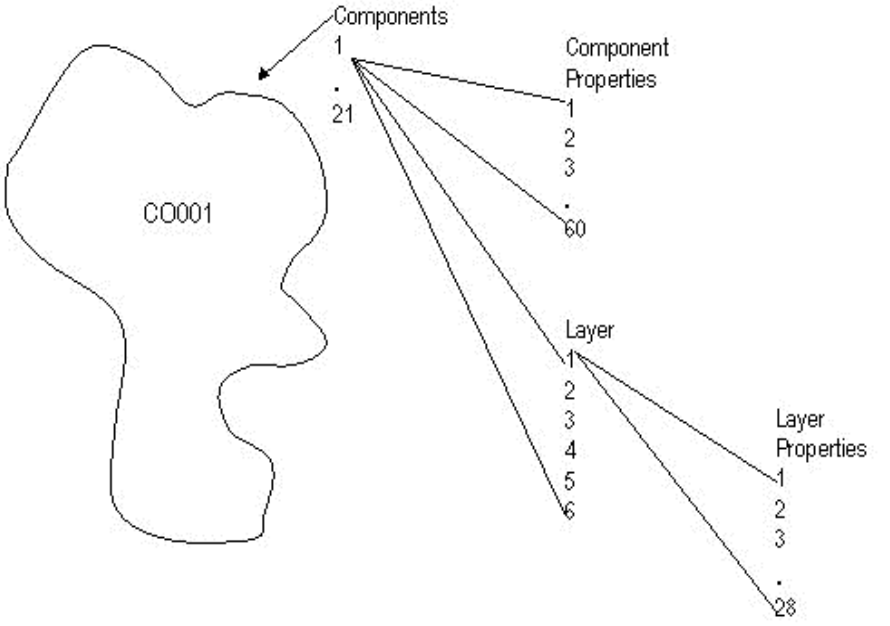


Figure 2 STATSGO Soil Map Unit

The analysis of the soils must begin at the lowest level in the schema and work back to the highest level. The order from the bottom to the top is layer, comp (component), and mapunit (map unit) tables (figures 3 and 4). The layer table is related to the comp table by muid (map unit identifier) and seqnum (sequential number), which is the component number. The comp table is related to the mapunit table by muid, and the mapunit table is related to the map data by muid. Other tables such as compyld (component yield), interp (interpretation), plantcom (plant community), rsprod (range site productivity), taxclass (taxonomic class), windbrk (windbreak), wlhabit (wildlife habitat), and woodmgt (woodland management) are on the same level with comp and relate to the comp table with muid and seqnum.

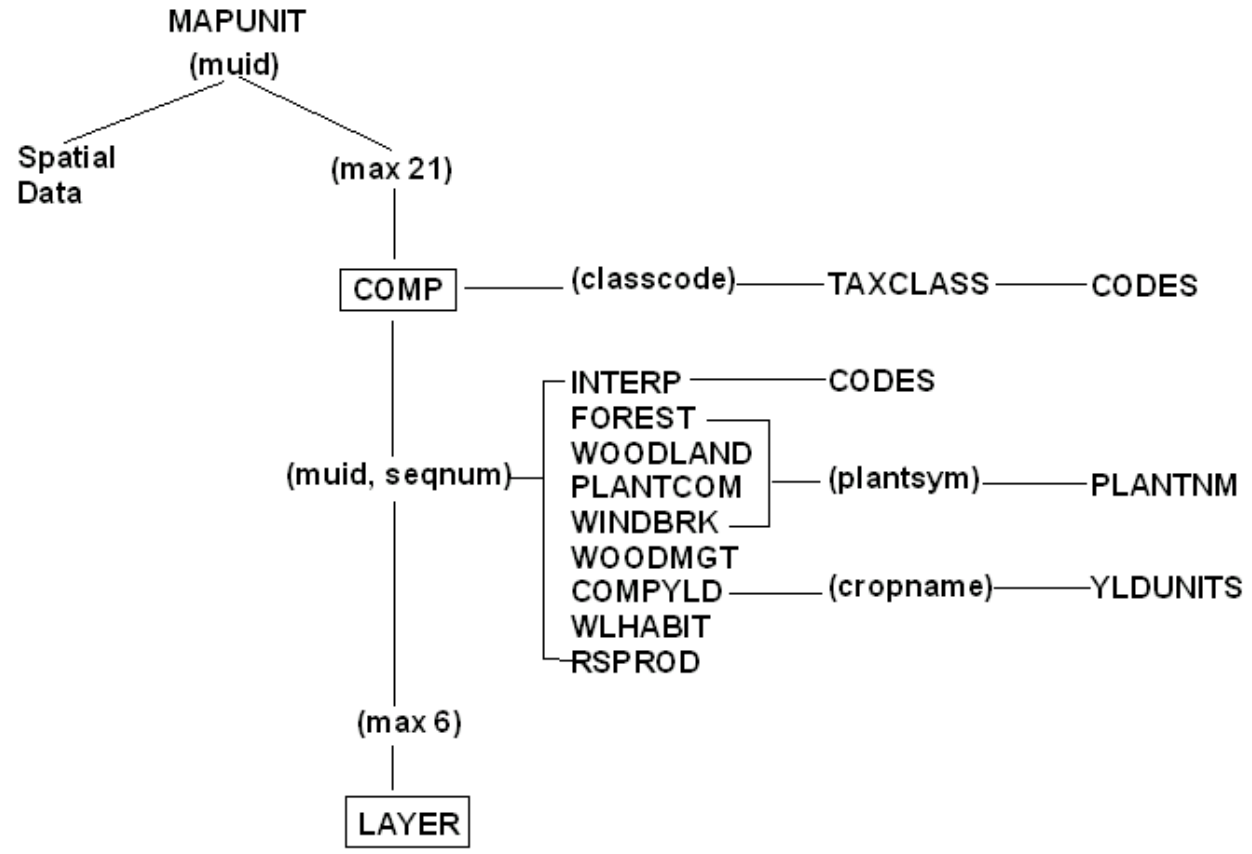


Figure 3 STATSGO table relationships

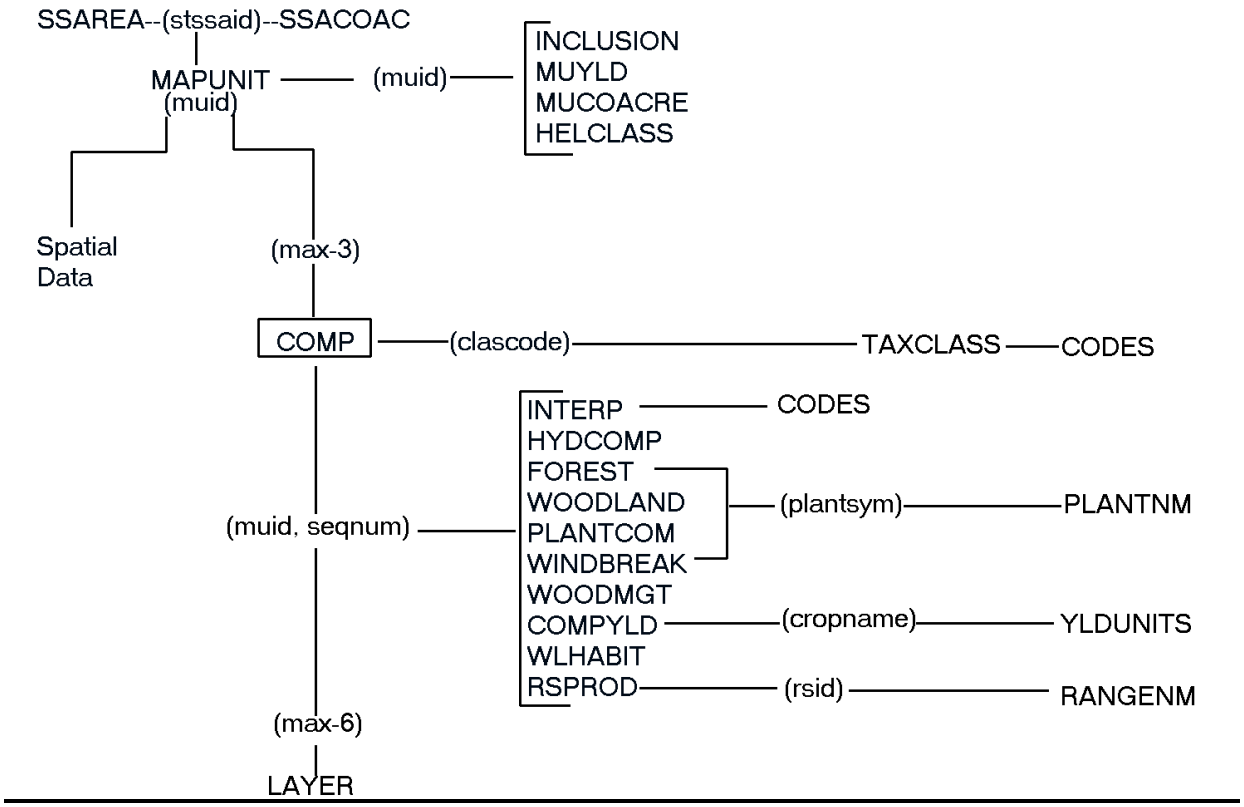


Figure 4 SSURGO table relationships

STATSGO Attribute (tabular) Data

The Soil Interpretations Record data for STATSGO consist of the following tables:

- **codes** (data base codes) stores information on all codes used in the data base
- **comp** (soil component) stores soil component information
- **compyld** (component crop yield) stores crop yield information for soil components
- **forest** (forest understory) stores information for plant cover as forest understory for soil components
- **interp** (interpretation) stores interpretive ratings (both limitation ratings and suitability ratings) for soil components
- **layer** (soil layer) stores characteristics of soil layers for soil components
- **mapunit** (map units) stores information that applies to all components of a soil map unit
- **plantcom** (plant composition) stores plant symbols and percent of plant composition associated for soil components

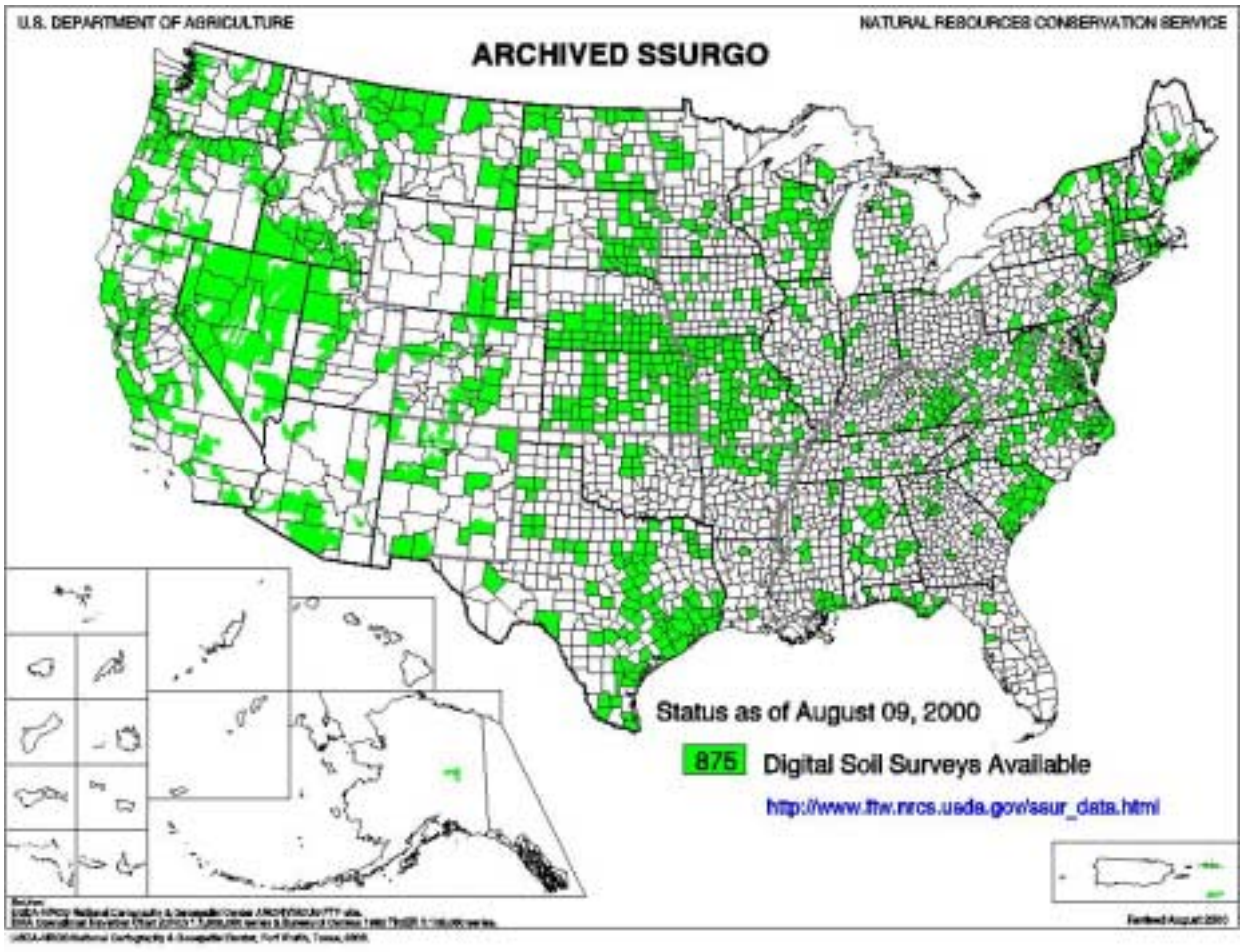
- **plantnm** (plant name) stores the common and scientific names for plants listed in the data base
- **rsprod** (range site production) stores range site productivity information for soil components
- **taxclass** (taxonomic classification) stores the taxonomic classification for soil components
- **windbrk** (windbreak) stores information on recommended windbreak species for soil components
- **wlhabit** (wildlife habitat) stores wildlife habitat information for soil components
- **woodland** (woodland) stores information on common indicator trees for soil components
- **woodmgt** (woodland management) stores woodland management information on soil components
- **yldunits** (yield units) stores crop names and the units used to measure yield

SSURGO Attribute (tabular) Data

- **codes** (data base codes) stores information on all codes used in the database
- **comp** (map unit component) stores soil component information
- **compyld** (component crop yield) stores crop yield information for soil components
- **forest** (forest understory) stores information for plant cover as forest understory for soil components
- **helclass** (highly erodible lands class) stores the highly erodible land classification for wind and water assigned to the soil map units
- **hydcomp** (hydric component information) stores data related to the hydric classification, criteria, and landform
- **inclusn** (map unit inclusion) stores the name of soils included in the soil map units
- **interp** (interpretation) stores soil interpretation ratings (both limitation ratings and suitability ratings) for soil components
- **layer** (soil layer) stores characteristics of soil layers for soil components
- **mapunit** (map unit) stores information that applies to all components of a soil map unit
- **mucoacre** (map unit county acres) stores the number of acres for the map unit within a county
- **muyld** (map unit yield) stores crop yield information for the soil map unit
- **plantcom** (plant composition) stores plant symbols and percent of plant composition associated with soil components
- **plantnm** (plant name) — stores the common and scientific names for plants listed in the data base
- **rangenm** (range name) stores the range site names

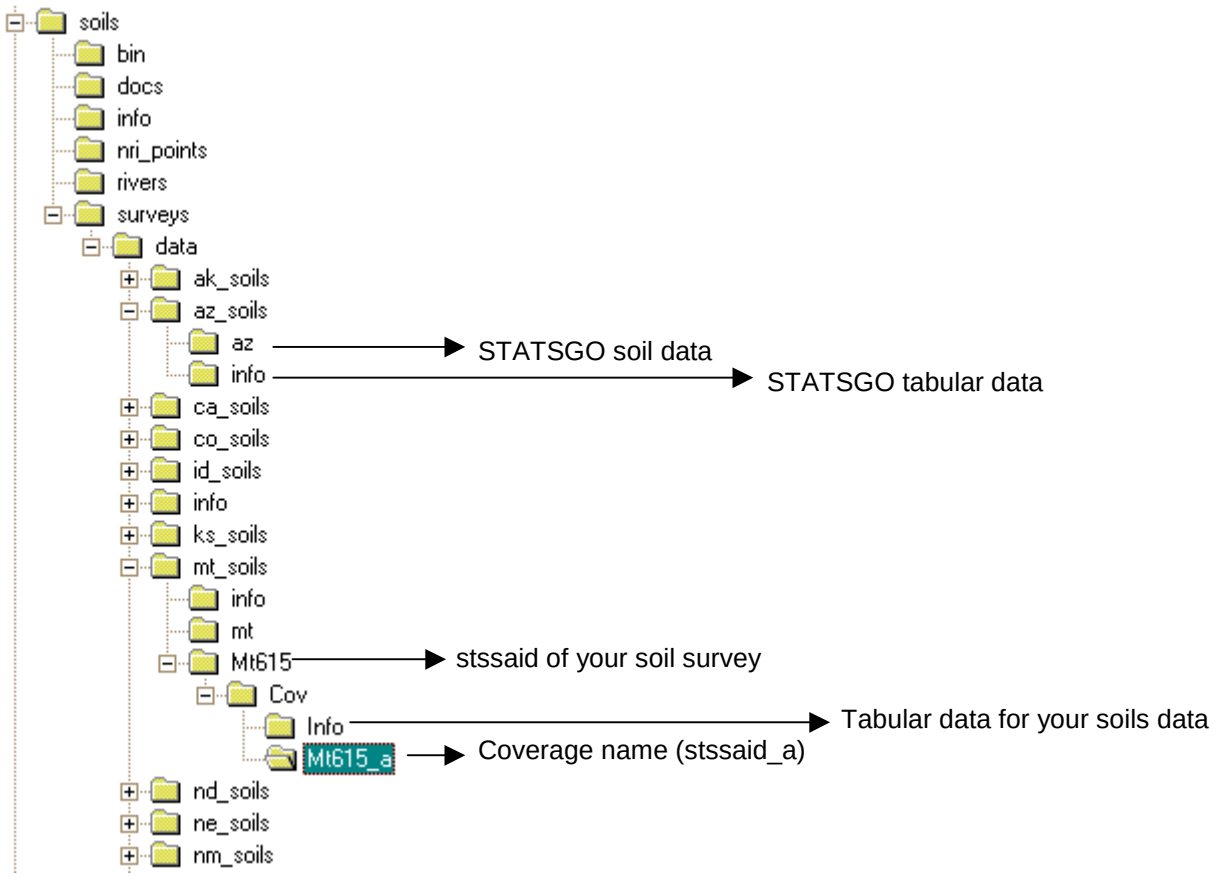
- **rsprod** (range site production) stores range site productivity information for soil components
- **ssacoac** (soil survey area county acreage) stores the acreage for the county within the boundary of the soil survey area
- **ssarea** (soil survey area) stores information that will apply to an entire soil survey area
- **taxclass** (taxonomic classification) stores the taxonomic classification for soil components
- **windbrk** (windbreak) stores information on recommended windbreak plants for soil components
- **wlhabit** (wildlife habitat) stores wildlife habitat information for soil components
- **woodland** (woodland) stores information on common indicator trees for soil components
- **woodmgt** (woodland management) stores woodland management information for soil components
- **yldunits** (yield units) stores crop names and the units used to measure yield

Appendix F - SSURGO Data Availability



Appendix G - Using Your Own Soil Data

To use your soil data with this extension there are a few simple rules that need to be followed. First, your data tables must be in the same format (data structure, named the same way) as NRCS SSURGO data. Second, the coverage name must be called, stssaid_a, (substitute your stssaid), this is the NRCS naming convention. Third, the data needs to be placed in the following directory structure.



Appendix H - Wind Erodibility Groups (WEG) and Index

WEG	Properties of soil surface layer	Dry soil aggregates more than 0.84 mm (wt.%)	Wind erodibility index (I) (tons/ac/yr)
1	Very fine sand, fine sand, sand, or coarse sand	1 2 3 5 7	310 [1] 250 220 180 150
2	Loamy very fine sand, loamy fine sand, loamy sand, loamy coarse sand, and sapric organic soil	10	134
3	Very fine sandy loam, fine sandy loam, sandy loam, coarse sandy loam	25	86
4	Clay, silty clay, noncalcareous clay loam, or noncalcareous silty clay loam that has more than 35 percent clay content	25	86
4L	Calcareous [2] loam and silt loam or calcareous clay loam and silty clay loam	25	86
5	Noncalcareous loam and silt loam that has less than 20 percent clay content or sandy clay loam, sandy clay, and hemic organic soil materials	45	48
6	Noncalcareous loam and silt loam that has more than 20 percent clay content or noncalcareous clay loam that has less than 35 percent clay content	45	48
7	Silt, noncalcareous silty clay loam that has less than 35 percent clay content, and fibric organic soil material	50	38
8	Soils not susceptible to wind erosion due to coarse fragments at the surface or wetness	--	0

[1] The "I" values for WEG 1 vary from 160 for coarse sands to 310 for very fine sands. Use an "I" of 220 as an average figure. If percent of coarse fragments by volume is 15-35, reduce "I" value by one group with more favorable rating. If percent of coarse fragments by volume is 35-60, reduce "I" value by two favorable groups. If percent of coarse fragments is greater than 60, use "I" value of 0.

2 Calcareous is a strongly or violently effervescent reaction of the fine-earth fraction to cold dilute (1N) HCL.

Appendix I - Resources

The NRCS National Soil Survey Handbook
(http://www.statlab.iastate.edu/soils/nssh/)

The NRCS National Pasture and Range Handbook
(http://www.ftw.nrcs.usda.gov/pdf/NRPH.PDF)

NRCS State Soil Geographic (STATSGO) Data Base Data use information
(http://www.ncg.nrcs.usda.gov/pdf/statsgo_db.pdf)

NRSC Soil Survey Geographic (SSURGO) Data Base Data use information
(http://www.ncg.nrcs.usda.gov/pdf/ssurgo_db.pdf)

ESRI has a few free courses on line in their **Virtual Campus** that anyone can take. If you have never taken one of the free classes the first thing that you will have to do is to register. This should not take more than a few minutes. It is recommended that you take the course Basics of ArcView. This course has three lessons and should take around 2 hours to complete.

Appendix J – NRCS Soil Element Descriptions

NRSC Soil Element	Description
awch	Maximum value for the range of available water capacity for the soil layer or horizon, expressed as inches/inch.
awcl	Minimum value for the range of available water capacity for the soil layer or horizon, expressed as inches/inch.
compct	The percentage of the component of the map unit.
hydgrp	The hydrologic group for the soil. Example: A, A/D.
kfact	An erodibility factor which is adjusted for the effect of rock fragments.
musym	The symbol used to identify the soil map unit on the soil map.
laydepl	Depth to the upper boundary of the soil layer or horizon, expressed in inches.
layernum	The sequence number identifying layers in the soil profile. A layer number of 1 would indicate the layer is the surface layer.
omh	The maximum value for the range in organic matter content of the soil layer or horizon, expressed in percent by weight.
oml	The minimum value for the range in organic matter content of the soil layer or horizon, expressed in percent by weight.
permh	The maximum value for the range in permeability rate for the soil layer or horizon, expressed as inches/hour.
perml	The minimum value for the range in permeability rate for the soil layer or horizon, expressed as inches/hour.
pHh	The maximum value for the range in soil reaction (pH) for the soil layer or horizon.
pHl	The maximum value for the range in plasticity index for the soil layer or horizon, expressed as percent of moisture by weight.
salinh	The maximum value for the range in soil salinity of the soil layer or horizon measured as electrical conductivity of the soil in a saturated paste. Values are expressed in mmhos/cm.
salinl	The minimum value for the range in soil salinity of the soil layer or horizon measured as electrical conductivity of the soil in a saturated paste. Values are expressed in mmhos/cm.
slopeh	The maximum value for the range of slope of a soil component within a map unit.
slopel	The minimum value for the range of slope of a soil component within a map unit.
stssaid	Three character numeric code which identifies the ssarea soil survey area. For survey areas covering a single county the ssaid is the county FIPS code. For multicounty survey areas the ssaid is identified in the Soil Survey Schedule. Example: 617,...012.
weg	The wind erodibility group (weg) assigned to the soil layer or horizon.